DOCUMENT RESUME

ED 045 631 56e TE 002 103

AUTHOR Burris-Meyer, Harold
TITLE An Inquiry into the Educational Potential of Non-Verbal Communication. Final and Interim Reports.
INSTITUTION Florida Ocean Sciences Inst., Inc., Boca Raton.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO BR-7-0646
PUB DATE Jul 70
GRANT OEG-4-8-070646-0021-007
NOTE 176p.

EDRS PRICE EDRS Price MF-$0.75 HC-$8.90
DESCRIPTORS Aural Learning, Disadvantaged Youth, Educational Innovation, Educational Methods, Emotional Experience, *Learning Processes, *Measurement Instruments, *Multisensory Learning, *Nonverbal Communication, Nonverbal Learning, *Peer Teaching, Polygraphs, Reading Instruction, Spelling Instruction, Visual Learning

ABSTRACT

This document contains eight progress reports of a research project testing the assumption that communication at the nonverbal level affects a student's emotional involvement in the material he studies and this the learning process itself. The project attempted to establish the educational potential of nonverbal communication by measuring emotional responses of students (K-college) to stimuli (music, slides, sounds, color, light, film) with a polygraph and an instrument (the Encabulator) developed and tested specifically for the program. It simultaneously applied nonverbal communication techniques to a peer-teaching program for disadvantaged students. Some conclusions reached by the study were that (1) teaching via the arts, in combination with peer to peer techniques is effective in developing and improving spelling and reading programs; and (2) nonverbal communication techniques--which require no special training-- are particularly effective in motivating the disadvantaged and result in improved learning rates, consistent attendance, and improved classroom behavior. (DD)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

BR 7-0646
~~PA 48~~
PA 56

ED045631

FINAL REPORT

PROJECT NO. 7-0646

GRANT NO. OEG-4-8-070646-0021-007

AMENDMENT NO. 2

AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION

Harold Burris-Meyer
Florida Ocean Sciences Institute, Inc.
604 Park Drive
University Park
Boca Raton, Florida 33432

July 1970

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TE 002 103

TABLE OF CONTENTS

	Page
INTRODUCTION	1
OPERATIONS 1969-70	
INVESTIGATION	3
APPLICATION	3
MEASUREMENT	4
CONCLUSIONS	5
APPENDIX A	
INVESTIGATION - BASIC STUDIES 1969-70	
APPENDIX B	
APPLICATIONS - CLASSROOM TESTS	
APPENDIX C	
MEASUREMENT: INSTRUMENTAL TEST OF AUDIO AND VISUAL STIMULI AND OF AN ENTERTAINMENT PROGRAM	

INTRODUCTION

This report, the eighth on Project - AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION (Short Title N-VC) completes the second phase of the inquiry. The problem is stated in the title. The educational potential of Non-Verbal Communication has been established.

From the outset, two assumptions have guided the inquiry. The first is that art forms communicate emotion at the non-verbal level. And, second, that learning is enhanced when the student becomes emotionally involved in the material which is being communicated to him.

A growing public consciousness which supports these assumptions is well stated by Sir Hubert Read in The Saturday Review of 6 December 1969:

> "I believe that there is only one way of saving our civilization and that is by so reforming its constituent societies that...the concrete sensuous phenomena of art are once more spontaneously manifested in our daily lives. I have called this reform 'education through art', and it now has advocates throughout the world."

During phase one 1968-1969 the investigating organization was formed, five full time, four part time, fifteen eminent consultants and thirty-four volunteer undergraduate and graduate students in Education. Office and laboratory were established and arrangements were made to operate in three schools in the Palm Beach and Broward Counties. Airtronics, Inc. of Herndon, Virginia built gratis our first testing apparatus, Encabulator Mark II, and the Columbia Broadcasting System undertook a cooperative testing program with N-VC.

Operations during Phase I included a survey of many facets of the problem with a view to relating them to the central problem - the educational potential of non-verbal communication. A bibliographic search was undertaken to adduce the best of existing knowledge to all areas under investigation. The bench mark thus established provided a starting point.

One study involving the preparation of a series of slide/tape programs using peer to peer teaching concepts in disadvantaged schools indicated the paucity of appropriate and effective teaching techniques and materials for this group. As a result it was decided that applying the use-the-arts approach to this group could be most immediately beneficial to education. Work with the disadvantaged population has been continued and expanded.

Finally, the instruments developed by the project to record immediate and continuous emotional response to classroom presentations clearly indicated that the principles involved were valid and indicated direction for future development.

Results of the first year's activity revealed that the question of precisely how the arts communicate has, to date, been under-researched by educators and generally ignored by the physical and life scientists and that this project was in the van of a world-wide movement advocating the use of the arts in teaching. The term non-verbal communication has become almost a household word since the inception of the project.

Quarterly Reports One (February 1968) through Seven (March 1970) have been sent to all addressees of this report. Therefore, details of operations included therein are not repeated here. The following section generalizes the work of Phase II of the project to date and the appendices carry a detailed record of the major endeavors completed since the last Interim Report.

OPERATIONS

1969—1970

Phase II operations had three elements:

1. INVESTIGATION: The build-up of a bank of information derived from bibliographic search and N-VC initiated psychological and educational research, this information to be used to guide the preparation of teaching materials and procedures which would carry the non-verbal emotionalizing and motivating factors inherent in the arts. (Appendix A).

2. APPLICATION: The preparation of teaching presentations based upon techniques used in the arts and the findings developed in the first element (above), and testing their effectiveness under closely controlled conditions in the schools. (Appendix B)

3. MEASUREMENT: The refinement and calibration of the test instrument (Encabulator), and seeking and identifying a significant correlation between a subject's written response to emotional stimuli presented in an art form and read-out from the device. (Appendix C)

These three elements of the study, while sequentially related, were, because of time limitations, pursued simultaneously.

INVESTIGATION

Published material pertinent to the problem of developing lesson plans which should carry an emotional impact was listed and referenced in Interim Report #7 and Appendix A. This information was, to be sure, spotty. Obvious gaps were made the subject of separate studies to the extent that time and personnel permitted. From the information, incomplete though it was, came useful guidance in preparing lesson plans as set forth in Interim Report #7.

Ten individual research programs were undertaken by education students from Florida Atlantic University under the guidance of N-VC personnel.

These students undertook a variety of experiments in area schools from kindergarten through senior college. They initiated original research and replicated on different populations previously published research. Results of these investigations indicate that other things being equal the mental attitude of the teacher as expressed in vocal tone has substantial effect

on retention of material, that subtle changes in background color and content can aid in children's recall performance, and that previous thinking on the teaching of homonyms may need to be revised. These studies are reported in detail in Appendix A and Interim Reports # 6 and 7.

While this area constitutes a field for study which can be pursued with profit for a long time, to which end specific arrangements have been made to carry various aspects forward in 1970-71 at Smith College, Ohio State University, Florida Atlantic University and Nova University, the data now in hand are sufficient to effect and augment the generalized N-VC approach to teaching via the arts. These studies will be published soon.

APPLICATION

The second phase carried on simultaneously with the first, although to a certain extent dependent upon and using data derived from it, consisted in applying art forms as generally understood to the teaching process. Project personnel trained and experienced in the theatre - the art form that utilizes all art forms - applied their background to initiating and amplifying spelling and reading programs in area schools.

In the teaching of spelling, rote learning was discarded in favor of "getting a feel" for the words through the arts. The students drew pictures, theatrically improvised, played games, wrote in the air in choreographed patterns, and wrote books and poems. Their work was systematically proofread by their peers.

The population for this program was black migrant children, for it is this population that has the greatest need for and derives the greatest benefit from improved teaching approaches. Throughout the school year pupil and teacher enthusiasm ran high. Books written and illustrated by these children now form a proud shelf in the school library.

Results from beginning and end of year testing show in some cases as much as a 110% increase in words used and a 42% improvement in spelling and punctuation errors over control classes taught by conventional methods. The specifics of this program, showing the arts as a teaching medium to be much more effective than conventional presentation forms, are set forth in Appendix B. Lesson plans for the spelling program are illustrated in the Sixth Interim Report and peer produced books and slide/tape presentations are discussed in detail in the Second Interim Report.

Fundamental to this aspect of our program has been the concept of peer teaching peer and communicating with peer through the artistic medium of the peer produced book and slide/tape show. These materials, written and illustrated and produced by students, give form to their tremendous creative energies and an immediate sense of achievement in producing something to be admired and enjoyed by their peers. Books in the form of mini-texts and biographies present the adult world to students in their own terms, while purely creative story books make manifest the child's world in a manner no adult can hope to approach.

The results of the N-VC spelling program provide quantitative evidence to the educator that teaching through the arts is an efficient and economical approach. When these techniques are coupled with peer to peer teaching and the production of teaching materials and applied, for example, to a reading program, considerable progress has been achieved in the direction of creating a reading program now only being generally discussed by educators; viz, a full use of the child's personal background and experiences in the teaching of reading. The final step would systemize this approach in the production of basal readers for various school populations. Thus this second element of the N-VC study establishes the effectiveness of the arts as a teaching medium, and by the same token, the educational potential of non-verbal communication.

A twenty minute film has been prepared to disseminate the findings. It illustrates in detail the steps in the production of a peer produced book. This film is now being used by N-VC personnel in lecture-demonstrations of some of the USE-THE-ARTS techniques before teachers and educators. Further projected work is concerned with applying these techniques to other disciplines, age and socio-economic groups, and educational levels.

MEASUREMENT

The third element of the program has been directed toward developing instrumentation to provide quantified instantaneous measurements of the effectiveness of classroom presentation and techniques developed in other parts of the program, i.e., to show to what extent the program emotionally turned the student on.

The instrumentation criteria were that it must be physically discrete, that nothing must be attached to the student, and that it must provide an instantaneous and continuous indication of the student's response to the presentation.

Meeting this set of criteria has involved the physical and life sciences and pushed equipment development to the limits of knowledge in some of these disciplines.

The instrument (Encabulator) developed during the past two years includes sensors which measure skin radiation and color change, respiration rate, bodily movements and muscular tension; all physiological concomitants of emotional state, change and rate of change.

Within the framework of N-VC criteria the encabulator has been employed in the study of relative effectiveness of presentations made by visual and auditory means, and for testing audience response to television presentations. In the laboratory correlations have been obtained between a subject's written response and his response as measured by the encabulator. This constitutes a signature which indicates "I like it" or "I don't like it".

Encabulator development, test, and initial use are reported in detail in Interim Reports One through Seven and in Appendix C of this report.

This phase of activity now requires replication of previous controlled experiments. The instrumentation requires further calibration and structural simplification and perfection of operational techniques.

CONCLUSIONS

1. The principle that non-verbal communication via the arts can be employed as a most effective medium for teaching disciplines other than the arts appears to be established.

2. Teaching via the arts in combination with peer to peer techniques has proven effective in the development and improvement of spelling and reading programs.

3. Teaching via the arts and peer to peer teaching require no special training.

4. These techniques are particularly effective in motivating the disadvantaged student whose background experiences do not relate to material found in commercially prepared teaching materials.

5. Teaching via the arts costs no more than teaching by traditional methods. Indeed it may cost less.

6. Instrumentation, though requiring further calibration and simplification, appears to be useful in its current form for instantaneous and continuous evaluation of classroom and entertainment presentations.

It must also be noted that the techniques so far developed in non-verbal communication are susceptible of considerable improvement through experience both in interpreting read-out and in applying N-VC techniques to subjects and age groups not yet studied under controlled conditions. This experience must be gained in the field as well as the laboratory. There is need for dissemination of the techniques shown to be useful now. A project to undertake these tasks has been submitted to the Office of Education by Nova University.

APPENDIX A

INVESTIGATION-BASIC STUDIES, 1969-70

This appendix contains details of methods and final statistical analyses of data and conclusions obtained from studies reported in Interim Report #7. Phenomena associated with learning were studied to provide guidance in developing USE-THE-ARTS lesson presentation techniques.

AUDIO LECTURE FACTORS IN STUDENT LEARNING-RETENTION

On the basis of previous studies indicating that there is audience sensitivity to emotions conveyed by speakers (Fairbanks, 1940), that audio style can influence attitude change (Dietrich, 1946), that speaker dynamism correlates positively with learning (Coats and Smidchens, 1966), and that monotonous lecture delivery decreases audience comprehension (Glasgow, 1952; Thomas, 1969): an experimental program was undertaken to test the hypothesis that the audio factor might significantly contribute to presentation effectiveness. Stringent controls were used to insure that the auditory stimuli were not embedded within other variables as speed of delivery, eye contact of speaker, and sound level.

Four classes of education students at Florida Atlantic University and four senior classes at a local high school were tested with a ten-item multiple choice test on the verbal content of the presentation following each version of a taped lecture pertaining to an art gallery. Test I was given immediately after the slide/tape presentation and Test II one week later. Four different modes of audio narration of the same verbal content were recorded by a female: 1) normal-interested lecturer; 2) illogically phrased; 3) indifferent; and 4) contemptuous.

Test results for both high school and college are presented in Table 1. The scores represent average number of correct answers per class for each type of audio interpretation on both Test I (immediate) and Test II (one week later).

TABLE 1

Audio Interpretation	College Test I	College Test II	College Class Grade Point Av.[1]	High School Test I	High School Test II	High School Class Grade Point Av.[1]
Indifferent	N=30 7.30	N=30 6.70	2.45	N=16 5.75	N=16 6.10	2.68
Contemptuous	N=21 6.81	N=21 8.10	2.21	N=20 6.45	N=20 6.90	2.02
Illogical	N=14 5.64	N=14 6.28	3.00	N=20 5.30	N=20 4.40	3.22
Normal	N=19 6.26	N=19 6.21	2.19	N=19 6.05	N=19 6.20	2.04
Guessing Factor[2]	N=14 3.75		2.45	N=14 3.00		2.32

[1]Class Grade Point Average = Average grade of class in all other subjects.

[2]Guessing Factor = Average test scores made by students without seeing presentation.

All results were compared by the Kruskal-Wallis one-way analysis of variance for independent samples (Seigel, 1956). Significant differences were indicated among the four modes of delivery for both high school and college on both Test I and Test II. These results are shown in Table 2.

TABLE 2

	H	df	Significance Level
High School			
Test I	9.79	3	$p < .05$
Test II	21.14	3	$p < .001$
College			
Test I	18.84	3	$p < .001$
Test II	16.60	3	$p < .001$

From this study, it appears that under circumstances in which the audio delivery is the only known factor contributing to differential effects upon learning-retention, more learning

takes place when the narrator implies some emotion rather than none. In fact, the present results indicate that more overall learning took place when the speaker was contemptuous of the subject matter being delivered. This is true for both Test I and Test II, implying that material was better retained over a period of time under the contemptuous condition. Least learning took place when the delivery was illogically phrased. These performance scores moreover were still greater than those obtained from classes tested without hearing the lecture (guessing).

The results point out that regardless of visual and other supporting media brought into the classroom setting, mode of verbal delivery contributes significantly to student performance. Practically speaking this could even indicate that the teacher in a bad mood, and communicating that mood in her tone of voice, may be teaching better than when she is in a pleasant mood.

For the future this study needs to be replicated with speakers conveying a wide variety of emotions and varying degrees of the same emotion.

NON-VERBAL RESPONSE TO COLOR

N-VC observed that the ubiquitous use of color in education from the walls of the classroom to shading in textbooks was under-researched. While considerable investigation of adult response to color was available, little work had been done on a younger population. Rosenberg, Langer and Stewart (1969) found that congruent color matching with postural-gestural representations were significantly more easily learned by adults than non-congruent color-figure pairs. N-VC assumed that this was a learned phenomenon and would show progressive changes from childhood to adulthood. This has not been verified.

Research design and results for third and sixth grade children were presented in the Seventh Interim Report. Results from first grade and high-school students are shown in Figure 1. No trend was obtained in the direction of the Rosenberg, et al. findings. Communication with Dr. Rosenberg has not revealed reasons for this lack of confirmation. Dr. Rosenberg is planning to replicate his study with a population similar to that employed by N-VC. It can therefore be tentatively concluded that congruent color need not be considered in preparing teaching materials or programs.

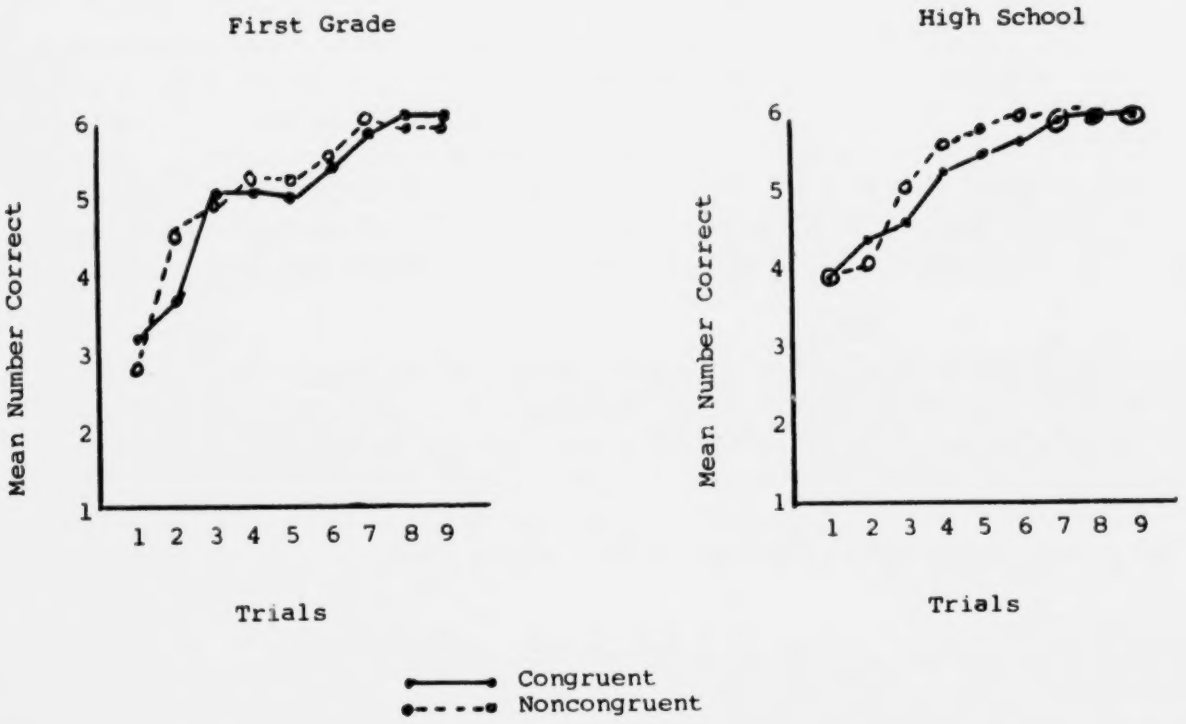


Figure 1. Mean Number Correct Responses Across Trials

ATTENTION-RETENTION INCREMENT AS A FUNCTION OF NON-VERBAL FACTORS

Several studies concerned with the influences of discrete non-verbal aspects of art forms and their effects upon releasing memory interferences were presented in the Seventh Interim Report. The studies have now been completed or extended, interpretation of data analysis has been undertaken to generalize findings for teaching through the arts.

A. Switching Between Words and Arabic Numerals.

The replication of studies discussed in Interim Report #7 employing privileged children as subjects at Smith College is not scheduled until the 1970-71 school year. Further studies undertaken with pre-school children are shown in Figure 2. The release of interference shown by this age level is quite similar to that found for grades one through six which was previously reported.

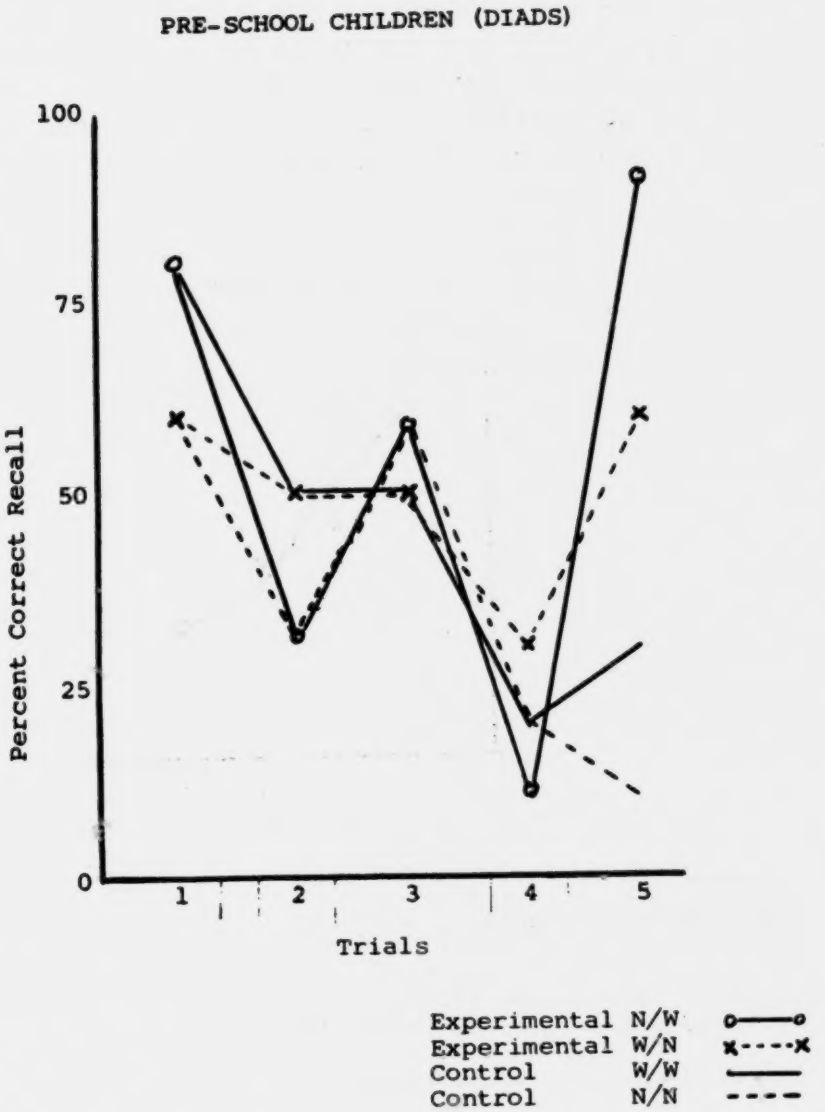


Figure 2. Context Shift

The improved performance of the experimental groups (those switching from words to numbers, or from numbers to words on Trial 5) with the infusion of a new category of material would tend to indicate that the pre-school age child does categorize learning material in a fashion similar to that of older children, as previously reported, and adults (Wickens, Born and Allen, 1963; Wickens and Clark, 1968). These results, of course, support the change of subject matter within the school day even for the very young child.

B. Background Color Change.

Research design and results from testing first, second and fifth grade students on the effects of changing background color in releasing memory interference were presented in the Seventh Interim Report. In that case, however, the content was always Arabic numerals. At each grade level it was found that ability to recall decreased as more and more of the same material was studied, but immediately following a background

color change, student performance showed high increase in recall for the same quantity and type material. As these findings pertained only to Arabic numerals as content, the same paradigm was tested using words in place of numerals. The findings are shown in Figure 3, for grades two and six.

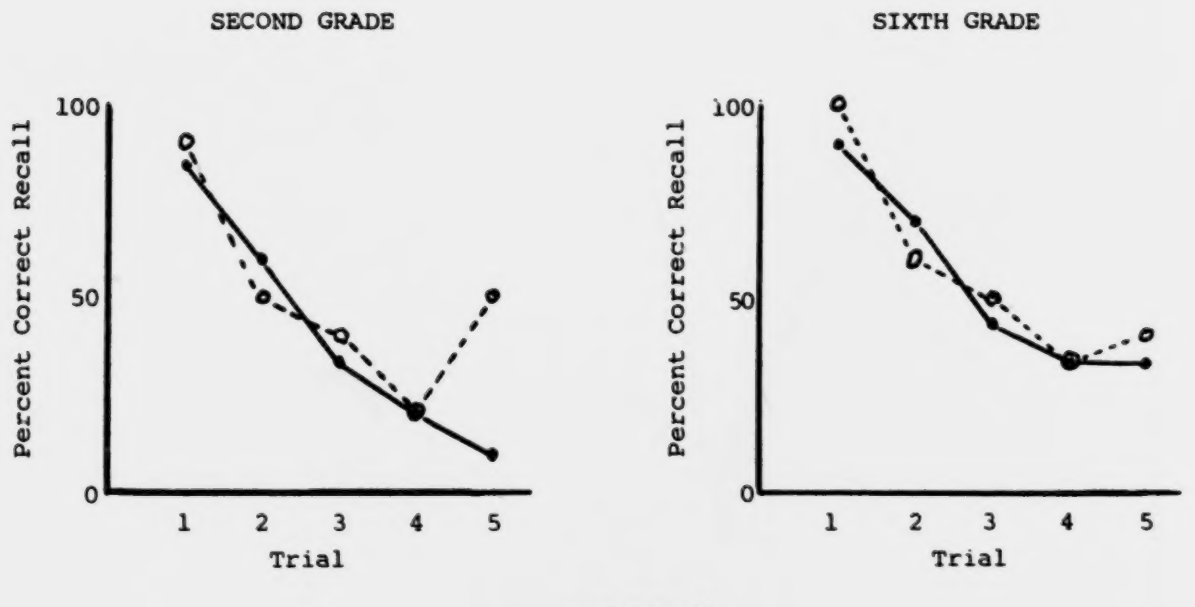


Figure 3. Background Shift
White lettered words on black background
and
Black lettered words on white background

The large increase following color change that was found for the previous study with numerals was not found. There was a significant increase in recall performance following color change for grade two ($X^2 = 5.83$, df=1, $p < .05$), but the increase was 40% lower than initial performance.

At the sixth grade level, changing background color had essentially no effect upon performance. The sixth grade results are consistent with those found for adults by D. Reutener (The Ohio State University, Unpublished Doctoral Dissertation, 1969) and indicate that children of this age group are influenced by color-word combinations on a more adult level. These results, along with those using numeral content, point to precautions that should be taken, particularly with younger children, in the use of color in teaching.

Generally speaking this study was undertaken to investigate the use of color in raising performance level of students. Results at this point could have a bearing on the use of color in the design of , for example, a mathematics text as opposed to a spelling text.

This study needs to be replicated using words on a larger scale, i.e., placing a color background behind a paragraph instead of a single word.

C. Male-Female Voice Switch.

On the basis of previously reported findings that changing of background color with numbers could serve to facilitate memory performance in children, an analogous approach with audition was attempted. Material was aurally presented to students, and at a point where performance was poor relative to initial performance, the voice was switched from male to female or from female to male. If the voice switch functioned aurally as the background color did visually with numbers, one would expect student performance to increase immediately following the switch.

Eighty elementary school students were tested, forty from the first grade, and forty from the sixth grade. The words and basic procedure were the same as those used in studies A and B reported above. The words were presented to the subjects from a previously recorded tape and the results are shown in Figure 4.

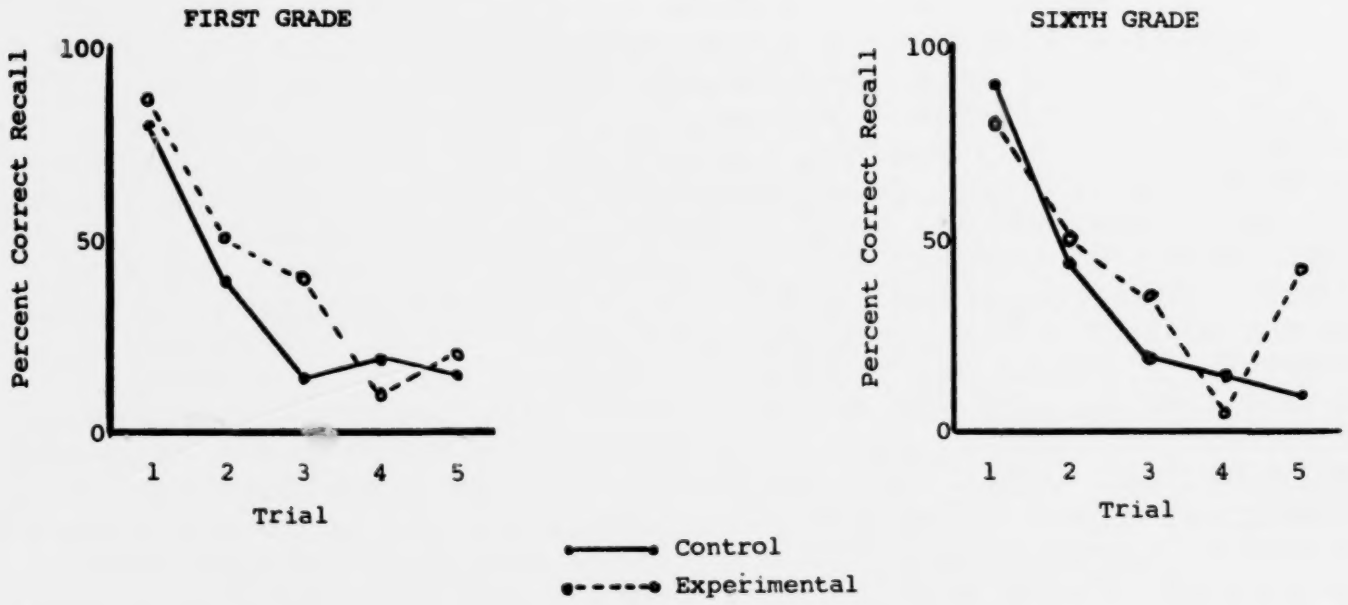


Figure 4. Voice Switch

Experimental: Male Voice to Female Voice or Female Voice to Male Voice
Control : All Trials Presented By Same Voice

The data from both grade levels were analyzed by the Fisher Exact Probability Test (Siegel, 1956). No significant difference was found between the control group (subjects receiving all trials with male, or all trials with female voice) and the experimental group (subjects receiving one or the other voice switch on Trial 5) for first grade ($p = 0.29$). There was a significant control vs. experimental group

difference at the sixth grade level however ($p = 0.02$). The increase in performance shown by students at the higher grade level was unexpected in that a pilot study run on adult subjects at the N-VC laboratory indicated that switching presented material from male to female voice, or vice versa, was relatively ineffectual in increasing adult performance in recall.

Although these results could be valuable as supportive or nonsupportive of the team teaching approach, the apparent inconsistency of our results does not substantially aid in either interpretation. The implications of the study are important enough to warrant an extensive study on both adult subjects and children through a range of age and grade levels.

EFFECTS OF REPETITION ON MEMORY: The Ranschburg Effect.

Results in this particular study of non-verbal effects upon memory function were not fruitful. Although facilitation of recall was obtained in lists containing repeated items closely adjacent for the original group of first grade students, (cf. Janke and Melton, 1968; Wolf and Jahnke, 1968, Exp. 11), the Ranschburg Effect, or the lowered performance in recalling lists where identical repeated items are separated by two or more intervening items was not obtained with upper grade students. The results for grade one students were given in the Seventh Interim Report. At that time four conditions of list presentation were used with repeated items in positions two and four out of lists containing five items. Regardless of whether the five-item list contained repeated items, there were two methods of visual presentation: 1) all items within a list were equally spaced (i.e., 39425 or 39495); 2) there was separation between serial positions 2 and 4 (i.e., 39 425 or 495). The list length was increased from five to seven items when second and fifth grade students were tested. This increase permitted the repetition of identical items in either positions 2 and 4, or in positions 2 and 5. Actual separation of items was then changed with the longer lists from between items 2 and 3 to between items 3 and 4. Prior to introducing this change, however, another large group of first grade students was tested to see if the performances would differ with the change. Results did not significantly differ between the two. The six conditions, with examples of each, are shown in Table 3.

TABLE 3

Conditions used for testing Ranschburg Effect:
Actual vs. Apparent visual separation of items

Condition	Definition	Example
I	no reated digits	3942571
II	non-repeated, broken	394 2571
III	repeated digits in positions 2 and 4	3949571
IV	repeated in positions 2 and 4 broken	394 9571
V	repeated in positions 2 and 5	3942971
VI	repeated in positions 2 and 5, broken	394 2971

The results for grades one, two and six are presented in Figure 5.

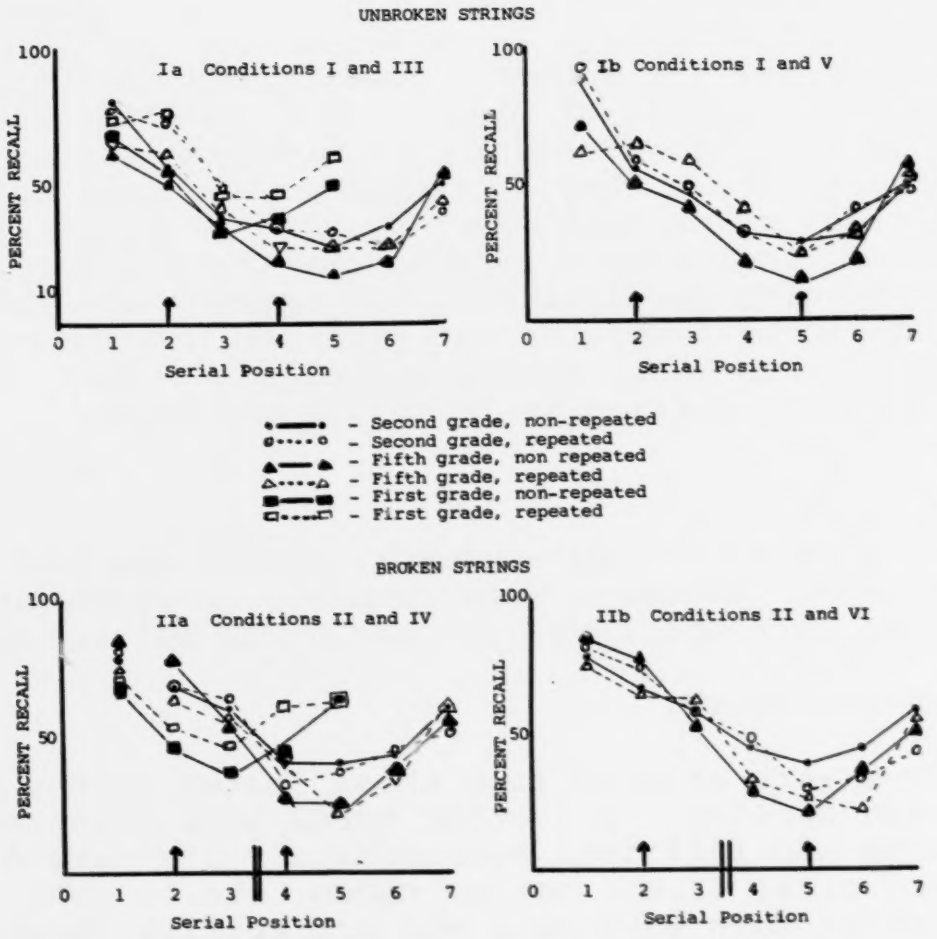


Figure 5

No statistical analyses were performed on the data, as no consistencies in performance were apparent. The typical bowed serial learning curve appeared in results from all groups, however, there does not appear to be any consistent difference in the curves among any of the groups. Jahnke notes in his 1969 (b) study that certain boundary conditions must be taken into consideration, such as length of string, type of elements, retention interval and ability level. The first three of these were accounted for in this study, but the ability level ranged from high to low at each grade level. This might account for some of the difficulty in obtaining the Ranschburg Effect. It would seem more likely however, that the effect is more tenuous than previously assumed. Although Ranschburg originally predicted that the inhibition effect would apply to such everyday classroom situations as spelling, results here reported are not supportive of this prediction.

EFFECT OF AGE LEVEL IN THE LEARNING OF HOMONYMS.

In this study we tested the hypothesis that visual discrimination of homonyms and thus the teaching of them would be more beneficial at an age level above that in which these words are ordinarily introduced. This assumption was based primarily on the findings of Riess (1946) in which younger children (ages 7-9) showed significant generalization between matched homonyms; i.e., they perceived these words as the "same" regardless of meaning (serf-surf). Older children, (age 12) however, indicated a progressive trend toward generalization of meaning (serf-slave). It appears possible that the younger children simply do not perceive homonyms as physically different (they appear visually similar), and as a result, have more difficulty in differentiation.

Subjects.

There were a total of 160 students; eighty age ten and eighty age twelve. Students were randomly assigned to four equal groups at each age level (20 per group per age level).

Materials and Procedure.

All homonyms were selcted from those listed in the Harper Row Fifth Grade Speller. All other words were selected from the same source and fell into approximately the same distribution of word class (i.e., verbs, nouns, etc.). The right and wrong item of each word pair was arbitrarily chosen, and that homonym designated as correct remained so throughout all lists, and between subjects. The exact lists showing correct

and incorrect items are presented in Table 4.

TABLE 4
Word pairs used for discrimination of homonyms

List 1 Matched		List 2 Random		List 3 Non-homonym words		List 4 Previously correct homonym plus previously incorrect non-homonym	
+	-	+	-	+	-	+	-
their	there	their	read	pal	tax	their	last
meat	meet	meat	there	sink	girl	meat	tax
sea	see	sea	bee	kite	last	sea	gun
buy	by	buy	see	fog	gun	buy	girl
be	bee	be	meat	mill	able	be	halt
here	hear	here	by	shut	halt	here	tail
red	read	red	hear	joke	tail	red	able

A regular paired-comparisons type discrimination task was used for testing. Each word was printed on a 3 x 5 index card. As each pair appeared the subject indicated his choice of the correct item by pointing to the card. The experimenter immediately said "yes" when the response was correct and "no" when the response was incorrect. The subjects were not informed of the homonym content. Each was given a brief description of the procedure and given one trial test on a practice list composed of two pairs of items that were unrelated to any of the items used in actual testing. Each subject was tested on only one of the four lists and practice on each list continued to a criterion of two consecutively perfect trials or to a maximum of fifteen trials.

Results.

Data were analyzed on the basis of trials to criterion for each subject by a 4 by 2 factorial with independent groups (Winer, 1962). The summary table is given in Table 5.

TABLE 5
Summary of Analysis

Source of variation	SS	df	MS	F	Significance Level
A (age groups)	1452.0	1	1452.0	196.2	<.01
B (type of list)	740.3	3	246.8	33.4	<.01
AB (interaction)	307.4	3	102.5	13.8	<.01
Within cell	1179.7	152	7.4		

A Newman Keuls Test was run on the significant interaction effect and indicated that the differences were due to the increased difficulty with either of the paired homonym lists, regardless of whether the list was composed of directly matched or randomly matched homonyms. This interaction effect is shown graphically in Figure 6.

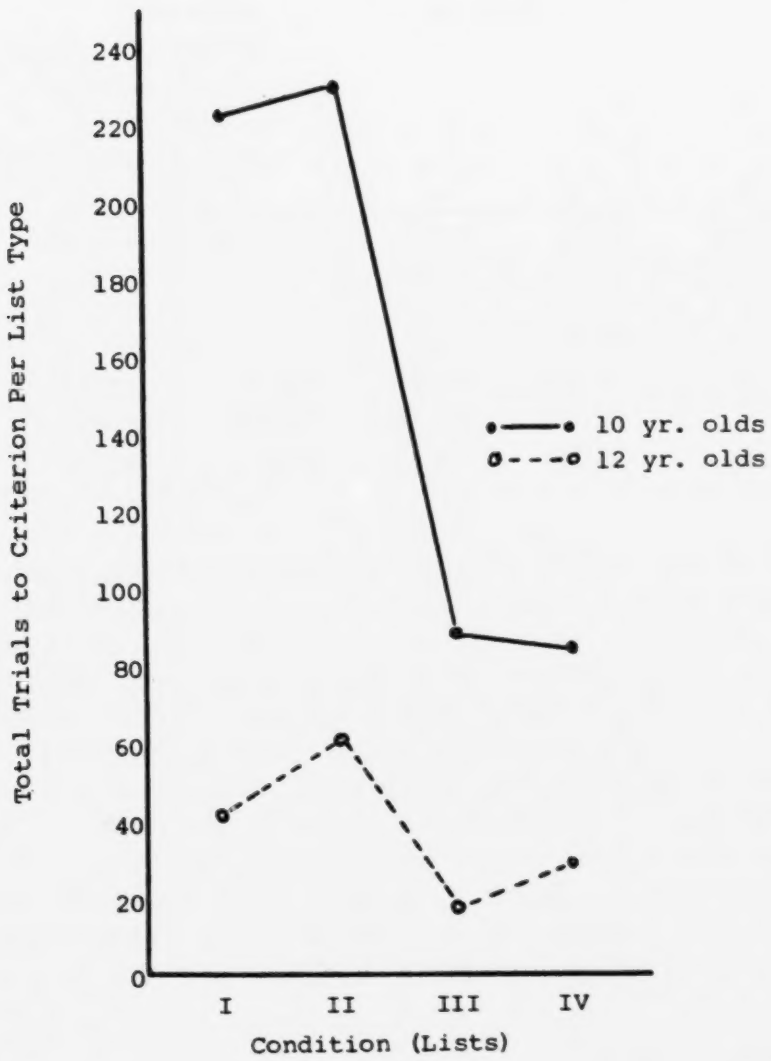


Figure 6. Comparison of 10 yr. and 12 yr. age groups in discrimination of homonym and non-homonym word pairs.

Discussion.

The range of scores within each age level and each list type was small, and lead us to believe that the sample size is adequate to support the thesis that children should not be introduced to homonyms at the age of ten. At least, the introduction of homonyms should not be within the same list of words. The difficulty experienced with the younger children certainly appears to be due to some non-verbal perceptual factor that does not appear by age 12.

REFERENCES

Coats, W. D. and Smidchens, U. Audience recall as a function of speaker dynamism. Journal of Educational Psychology, , 1966, 57, 189-191.

Dietrich, J. E. The relative effectiveness of two modes of radio delivery in influencing attitudes. Speech Monographs, 1946, 13, 58-65.

Fairbanks, F. Recent experimental investigations of vocal pitch in speech. Journal of Acoustical Society of America, 1940, 2, 457-466.

Glasgow, G. M. A semantic index of vocal pitch. Speech Monographs, 1952, 19, 64-68.

Jahnke, J. C. The Ranschburg Effect. Psychology Review, 1969, 76, 592-605. (b)

Jahnke, J. C. Output interference and the Ranschburg Effect. Journal of Verbal Learning and Verbal Behavior, 1969, 8, 614-621. (a)

Jahnke, J. C., and Melton, A. W. Acoustic similarity and the Ranschburg phenomenon. Proceedings, 76th Annual Convention, A P A, 1968, 65-66.

Riess, B. F. Genetic changes in semantic conditioning. Journal of Experimental Psychology, 1946, 36, 143-152.

Rosenberg, B. G., Langer, J. and Stewart, J. Non-verbal learning. American Journal of Psychology, 1969, 82, 181-190.

Seigel, S. Nonparametric statistics; for the behavioral sciences. New York: McGraw Hill, 1956, 184-193.

Thomas, S. H. Effects of monotonous delivery on intellligibility. Speech Monographs, 1969, 36, 110-113.

Wickens, D. D. and Clark, S. Osgood Dimensions as an Encoding class in short-term memory. Journal of Experimental Psychology, 1968, 78, 580-584.

Wickens, D. D., Born, D. G., and Allen, C. K. Proactive inhibition and item similarity in short-term memory. Journal of Verbal Learning and Verbal Behavior, 1963, 2, 440-445.

Winer, B. J. Statistical Principles in Experimental Design. McGraw Hill, 1962.

Wolf, T. M. and Jahnke, J. C. The effects of intraserial repetition on short-term recognition and recall. Journal of Experimental Psychology, 1968, 77, 572-580.

APPENDIX B

APPLICATION

CLASSROOM TEST OF THE TEACHING OF SPELLING BY THE USE OF THE ARTS

BACKGROUND

Most children are taught spelling using the traditional approach which incorporates words presented in a list on Monday and eventual testing on Friday. Bradley (1965) stated that "traditional spelling doesn't do the job". He suggested grouping the children to tutor each other which, in essence, is peer-teaching. He further stated that "the more often the program in spelling is varied and individualized, the more likely the real spelling needs of today's youth will be mastered". Travers and associates (1964) obtained confirmative evidence that through student participation (peer to peer relationship), students do better. Mutual helpfulness was found to be more effective than competition (Horn, 1967).

Research into various methodological approaches to teaching of spelling indicate that: 1) pronunciation makes a difference (Dailey, 1967); 2) when words are studied in lists, learning is more efficient, the words are learned more quickly, remembered longer, and transferred more readily to new contexts (Horn, 1967); 3) incorporation into the entire language arts is important - as Hillerich (1967) points out, "there is no point in learning to spell words that one is not going to use in his writing".

Experiments conducted to determine the effects of proofreading on spelling indicate that teaching methods emphasizing proofreading create a significant improvement in learning. (Bishop, 1965). Personke and Knight (1967) noted that two requirements in proofreading seem to predominate in the writing and research in the teaching of spelling: a) the students must attain a degree of motivation; b) the students must attain certain techniques of proofreading. They recommend that future research concentrate upon 1) involving more pupils with varying degrees of intelligence and spelling ability; 2) extending beyond three weeks of the entire program the effectiveness review; 3) establishing the effects of proofreading upon vocabulary development. Finally when students are required to make overt responses, there is both a direct and indirect attentional effect upon the child (Travers, 1964). Learning to spell is a multisensory process. In writing, we draw upon some type recollection of the word, see it when written and gain a sense of the "feel" of the word as we write (Hodges, 1966).

It was the purpose of this study to determine whether the teaching of selected lessons in spelling, using the "Arts" to motivate the students, peer-to-peer teaching (Bradley, 1965) Travers, et al, 1964), proofreading skills (Hillerich, 1967); Personke and Knight, 1967), and sensory processes (Hodges, 1966) would provide a means of securing greater spelling achievement. The study was undertaken in grades one through six in an elementary school located in the southern part of Florida.

METHODS

Subjects

Approximately 1,000 students in the test school participated in the overall program. All students in one class from each grade level (grades one through six) served for the experimental program. There was at least an equal number of control classes from the same school. The control groups were taught spelling by the traditional methods used by the respective teachers at each grade level.

In an effort to use a multi-sensory approach in presenting the spelling words, visual aids were used whenever possible (i.e., charts, picture cards, word cards, acetate preparations with overhead projectors). Each child had his own folder in which he kept his class work in spelling. Each student was responsible for his own folder throughout the program. The State adopted text, Harper/Row Basic Speller, appropriate to each grade level was used as a guide in the selection of spelling words and skills. This method of obtaining words and skills was used to assure that the experimental groups would be exposed to the subject matter that they should have at proper grade levels. The method of word presentation, application and reinforcement, however, arose from the background experience and knowledge of the arts of the N-VC staff, and the assistance of students from Florida Atlantic University Department of Education. The guiding principle was to capitilize on the techniques and built-in emotionalizing effect of all the arts to involve and motivate the students in learning to spell. To this end the USE-THE ARTS checklist was prepared. (Figure 1).

USE-THE-ARTS CHECK LIST

VISUAL

Draw - Peer Produced Book
Paint - " " "
Letter - " " "
Carve
Sew
Model

MOVEMENT

Dance
Drawing in the air
Simple rhythmic movement

AUDITORY

Sing
Tell story - record for book
Play instrument
Imitate machines

CREATIVITY

Improvise dialogue)
Make up story - peer produced book)
Compose song) and record
Make up lyric to song)
Write a poem)
Be the word

MOTIVATIONAL SKILLS ACTIVITIES

Charade
Baseball
Find the word (Nouns)
Do the word (Verbs)

HOLIDAYS

Focus any of the above activities on national, state and local holidays.

Figure 1.

Procedure:

Each week teachers in the experimental group were presented with a detailed outline for a daily half hour spelling program. The basic format for each day was as follows:

On the first day, the new spelling words for the week were introduced to the children. The main purpose of the first lesson of the week was to develop a clear image of the word, a concise pronunciation of the word, and a clear understanding of the meaning of each word. The students used each of the words in sentences, poetry, etc. They also wrote the words in the air. This would involve large bodily movement and provide the teacher with a quick view of each child's letter perception. The children also wrote the words on paper.

The second lesson stressed recall or memory of the words introduced the first day. Each word and meaning was reviewed in much the same manner as in the first lesson. Following this review the teacher encouraged the children to write their own sentences, thereby providing an opportunity for both reading and writing experiences necessary to the development of their abilities to spell or write from memory. The students were then encouraged to draw pictures to illustrate their words or sentences. With the completion of his class work, the student carefully checked his work for any errors and then entered it into his folder.

The third day was proofreading day. With experimental groups at each grade level it was possible for each student to not only proofread his own work, but also the work of a student in another class, generally a grade lower. Prior to the spelling period on this day, all spelling work throughout the experimental classes within the school was exchanged by classes. First grade work was passed to second grade, second grade to third grade, etc. This method of proofreading was considered necessary for several reasons: 1) no student felt threatened in the process since his work was being proofread by an advanced student; 2) this enabled the student to have some pride in his own skill in writing, plus the idea as serving as a big brother to help a student in the grade below him who could benefit from his advanced knowledge; 3) this should have spurred the advanced child on (increased his motivation) to fulfill his own expectations that he could be beneficial to the younger child. The proofreading session gave all of the students an opportunity to practice proofreading skills, and to realize the importance of doing their own work as carefully as possible. Of not the least importance, this method of proofreading brought about a unified effort throughout the experimental classes of each grade level within the entire school.

On the fourth day, the folders were returned to each original author. All items were circled lightly by the advanced student who had proofread the work. Any errors which the authors found circled were checked against their list to make certain the word was wrong, then appropriate corrections were made. In addition, time was made available for completing or continuing drawings related to the spelling words.

The fifth day (and time permitting, part of the fourth day) provided for a variety of reinforcement exercises and activities that encouraged total student involvement. Spelling activities such as theatrical improvisation, baseball, charades, choreographed group spelling in the air, Find-the-Noun, Do-the-Verb, and Clap-Hands, promoted peer communication and teamwork. Another activity found to be particularly successful was using the spelling words to create new lyrics to familiar tunes. These songs were frequently recorded. The reinforcement exercises tested the pupil's ability to retain the correct spelling of each word in context and related contexts.

Throughout the program many techniques were tried to appeal to the child's senses - visual, tactile and aural. Students were encouraged to use words that were common to them and to learn and use new words. They were encouraged to write stories and poetry of their own creation. Such exercises deviated from the usual approach to class work, thus promoting and maintaining interest level and motivation.

Testing procedures for analysis of effectiveness of program

Two types of tests were used at both the beginning of the year and at the end of the year to enable comparisons between the experimental and control classes.

1) Written stories from all students, both from experimental and control classes. In order to obtain these data, all students were shown two pictures at the beginning of the year and asked to write stories about the pictures. The same procedure was used at the end of the year. All stories were collected and scored for composition; i.e., number of sentences attempted, incorrect punctuation, spelling errors.

2) Stanford Achievement Test

RESULTS

Story Writing

The pre and post year results of analysis of errors in student written stories are shown in Figures 2 through 7 for both experimental and control groups in grades one through six.

A summation of results for grades one, two and three is shown in Figure 8 and for grades four, five and six in Figure 9. All students were shown two pictures at the beginning of the year and asked to write stories about the pictures. The same procedure was used at the end of the year. All stories were collected and scored for composition; i.e., number of sentences attempted, incorrect punctuation, spelling errors. Error ratios were obtained and plotted for both experimental (those receiving the arts spelling program, and control (those taught by conventional methods) classes. These results leave no doubt about the success of our approach to teaching via the arts in comparison with conventional teaching methods. Throughout the experimental groups there were vast increases in the number of words and sentences used between beginning and end of year in comparison with the comparable control classes. (see right side of each graph, and for a single example see Figures 10, 11 and 12). When we look at reduction of errors in the same comparisons (left side of each group) the experimental groups far surpass the control groups.

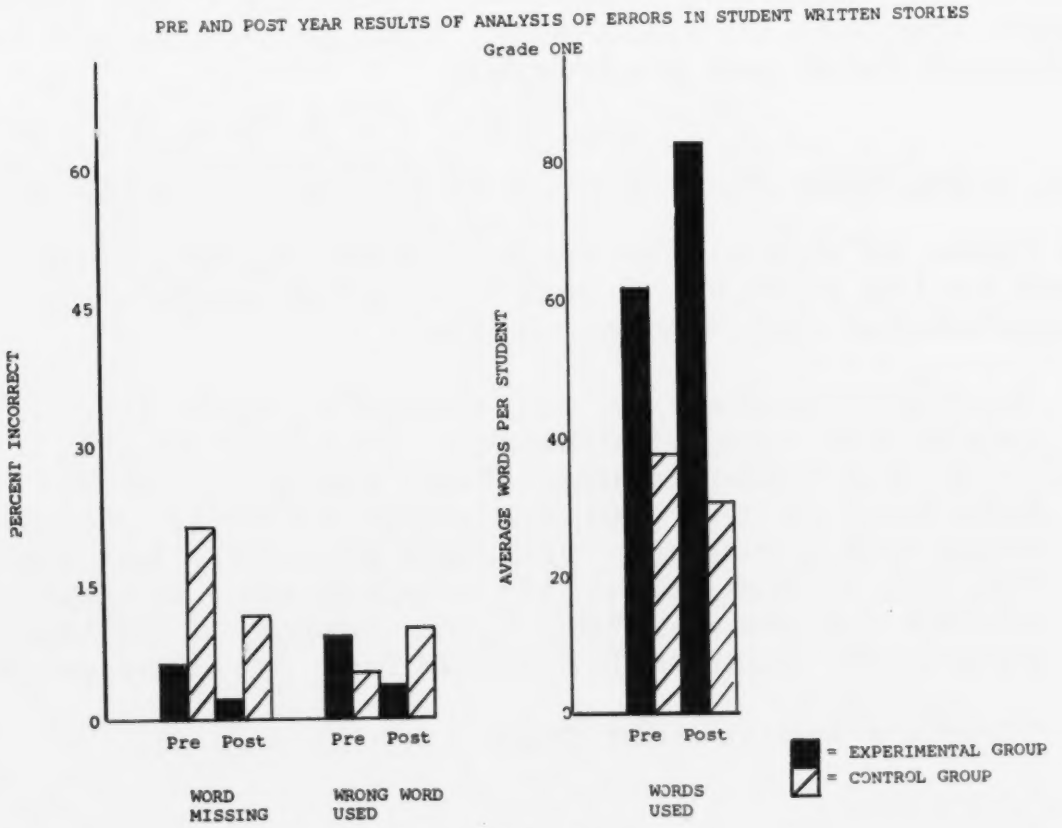


Figure 2.

PRE AND POST YEAR RESULTS OF ANALYSIS OF ERRORS IN STUDENT WRITTEN STORIES

Grade THREE

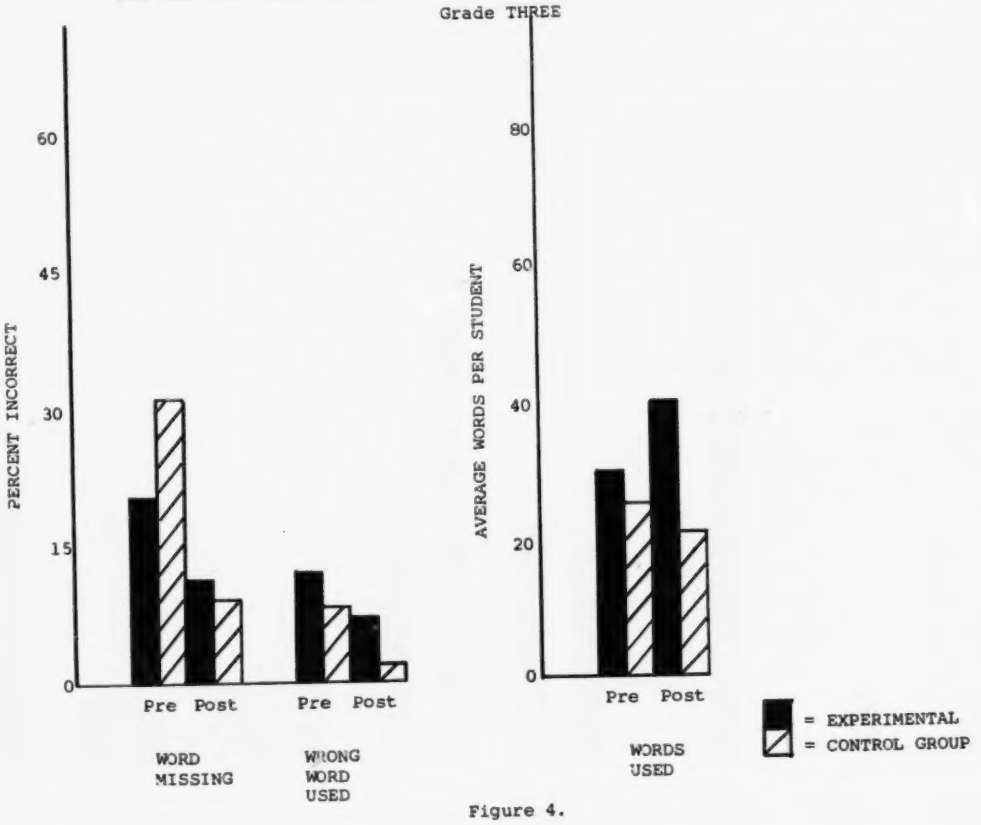


Figure 4.

PRE AND POST YEAR RESULTS OF ANALYSIS OF ERRORS IN STUDENT WRITTEN STORIES

Grade TWO

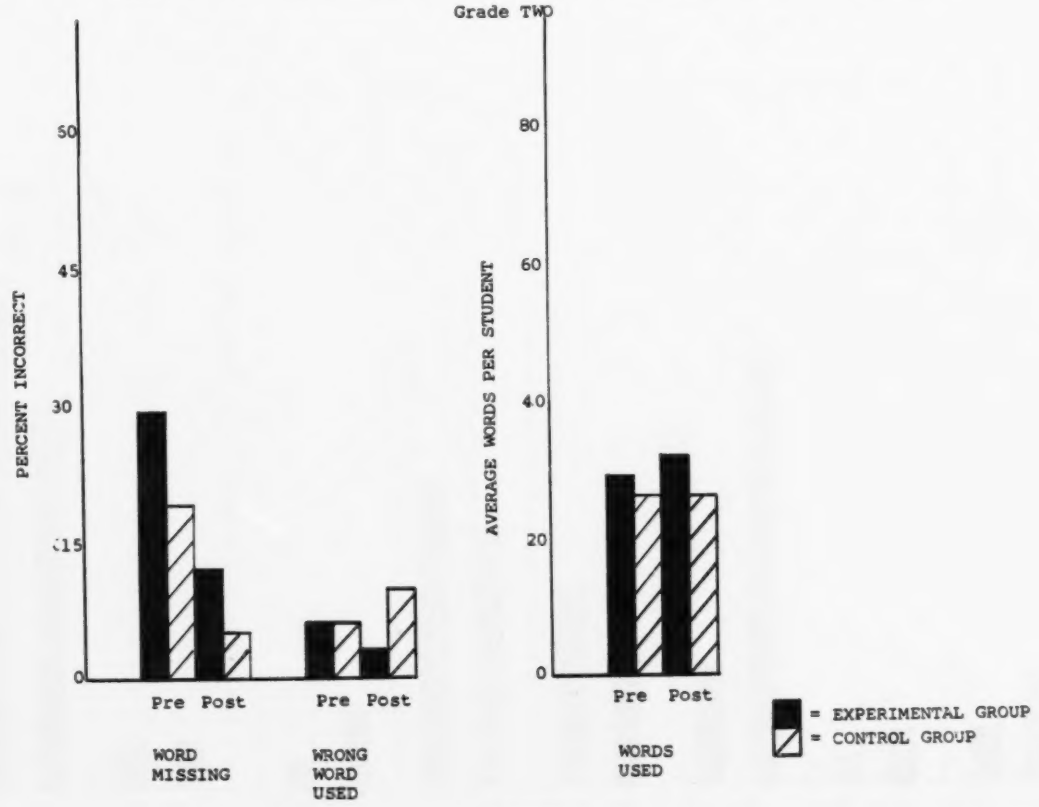


Figure 3.

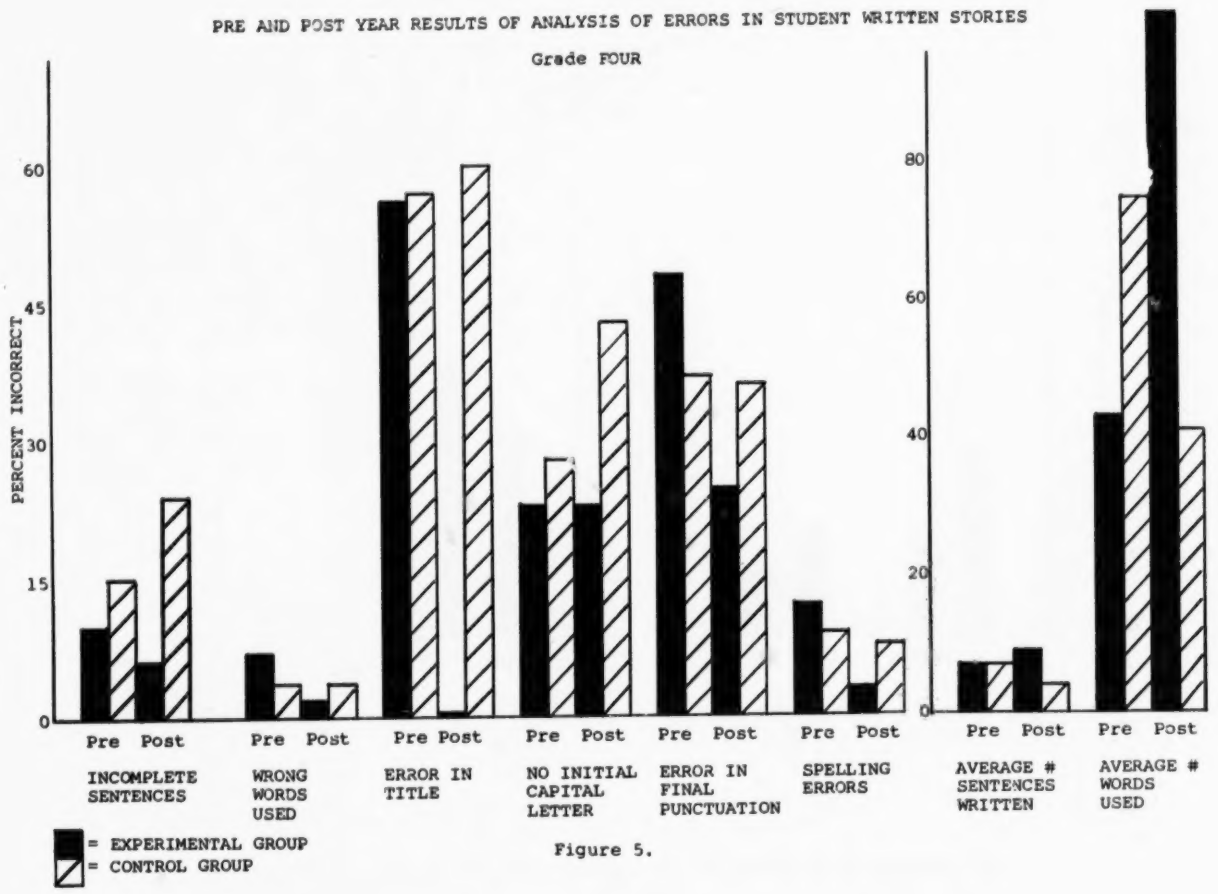


Figure 5.

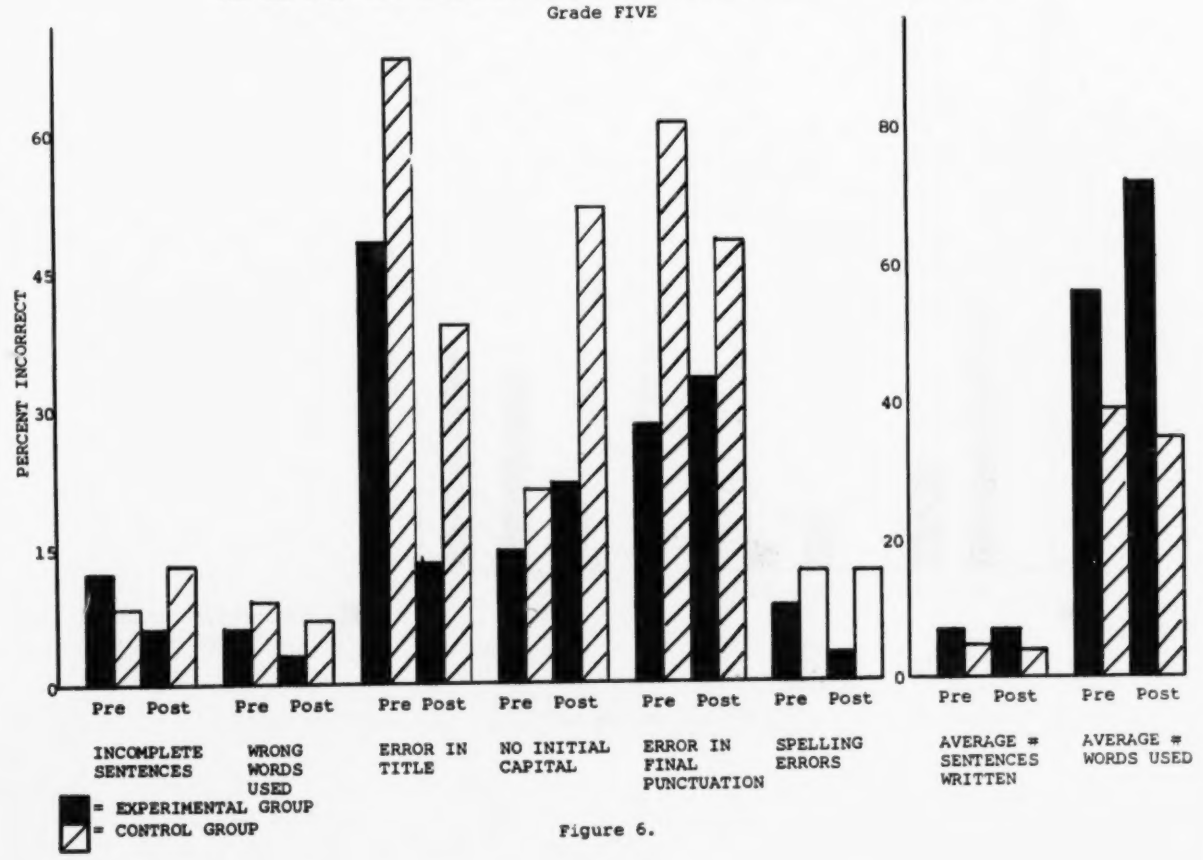


Figure 6.

PRE AND POST YEAR RESULTS OF ANALYSIS OF ERRORS IN STUDENT WRITTEN STORIES

Grade SIX

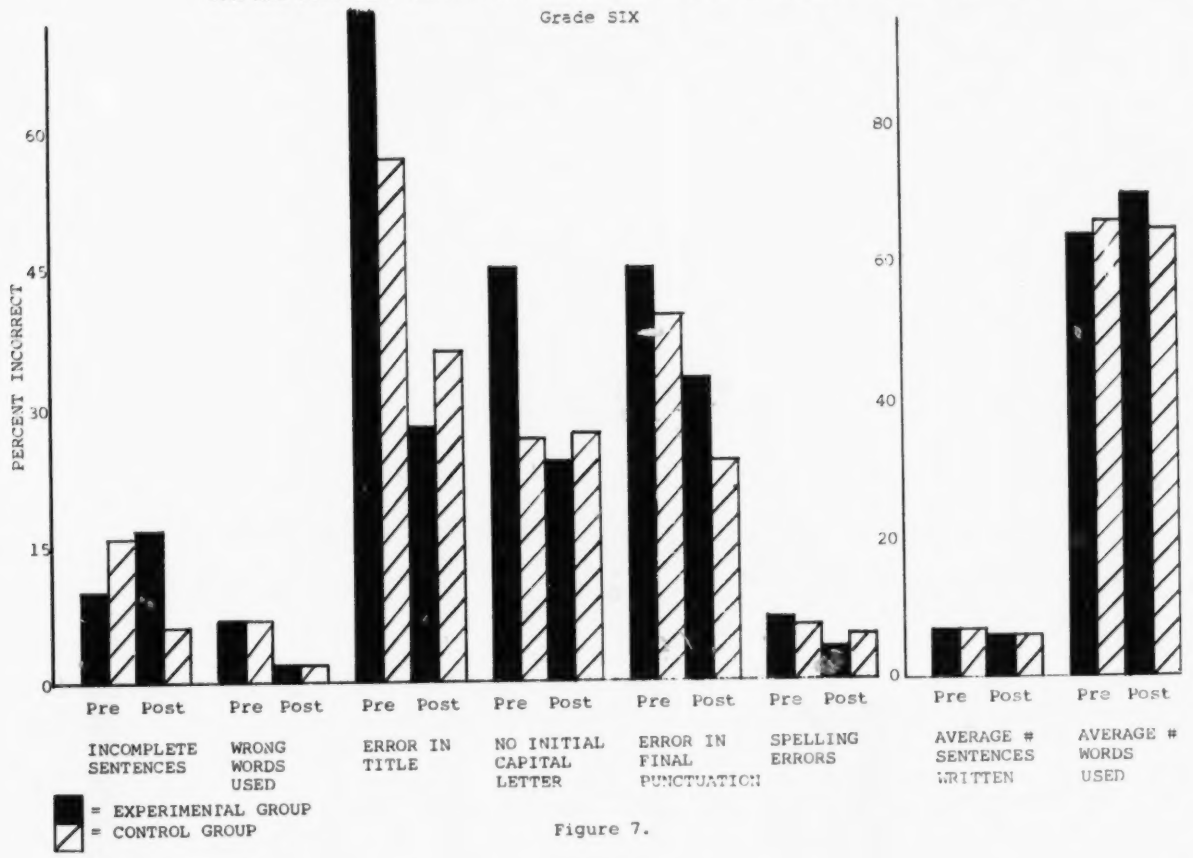


Figure 7.

PRE AND POST YEAR RESULTS OF ANALYSIS OF ERRORS IN STUDENT WRITTEN STORIES

Average for Grades ONE, TWO, THREE

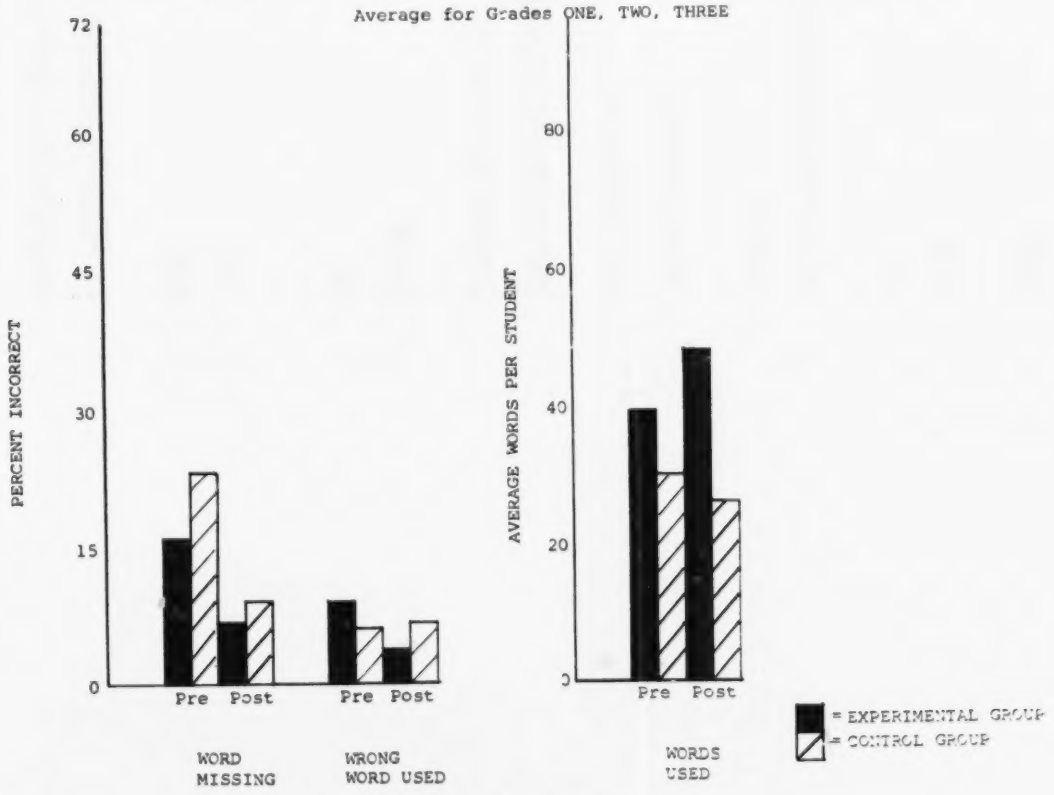


Figure 8.

PRE AND POST YEAR RESULTS OF ANALYSIS OF ERRORS IN STUDENT WRITTEN STORIES
Average for Grades FOUR, FIVE, SIX

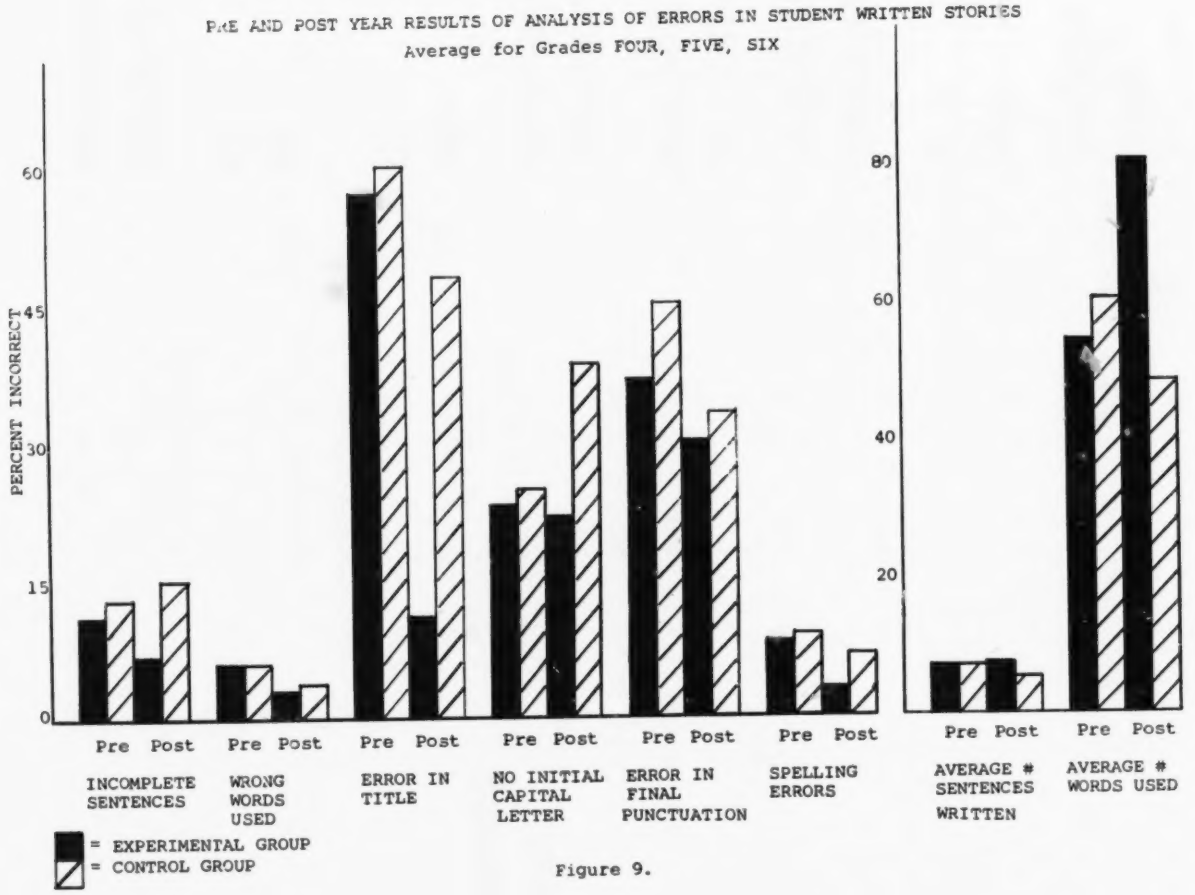


Figure 9.

Name Sheila Byrd

Beauty and the Beast

(1) He was a prince.
(2) The lion is thinking.
(3) He wants some company.
(4) He will have some company

The Three Bears

(1) They were fighting over some fish.
(2) Now they are pulling the rope from each other.
(3) The two bears want the fish
(4) The rope will pop.

Figure 10

Sample story written by experimental group student at start of Spelling Program. October 1969.

Sheila Byrd 4/14/70
Mrs. Harrison's 4th grade

The Tiger and the Monkey

Once upon a time in a deep part of the jungle, there lived a vicious tiger. One day while the tiger was asleep a little monkey came by having fun alone and he disturbed the tiger while he was sleeping. And the tiger said in a vicious voice, "Leave me alone." Then the monkey said in a low voice, "Lets make a deal. If you catch me I will leave you whenever I pass by you."
The tiger said, "Alright." And so they started running the tiger got tired and said, "You win. I'm as tired as a doornail. From now on you can pass by and bother me any time you like." And they lived happily ever after

The End

Figure 11

Story written by same student
at end of Spelling Program.
April 1970

B-12

Sheila Byrd
Mrs. Harrison's 4th grade

4/14/70

The Family of Monkey's

Once apon a time there was a family of monkeys. There wase the mother, the father, the boy, and the grandpa. Everytime the father monkey hears something about somebody he tells the family Thats why they know so much about the world One day a monkey named Billy picked a fight with the boy monkey. The baby monkey fought back because his grandpa told him always to defend himself. And so that day the boy monkey said to his grandpa, "Why don't they like me", said The boy monkey.
The grandpa said, "I believe they are jealous of you. Just act normal tomorrow and when you see Billy tell him you are sorry."
The boy monkey said, "I will."

The End

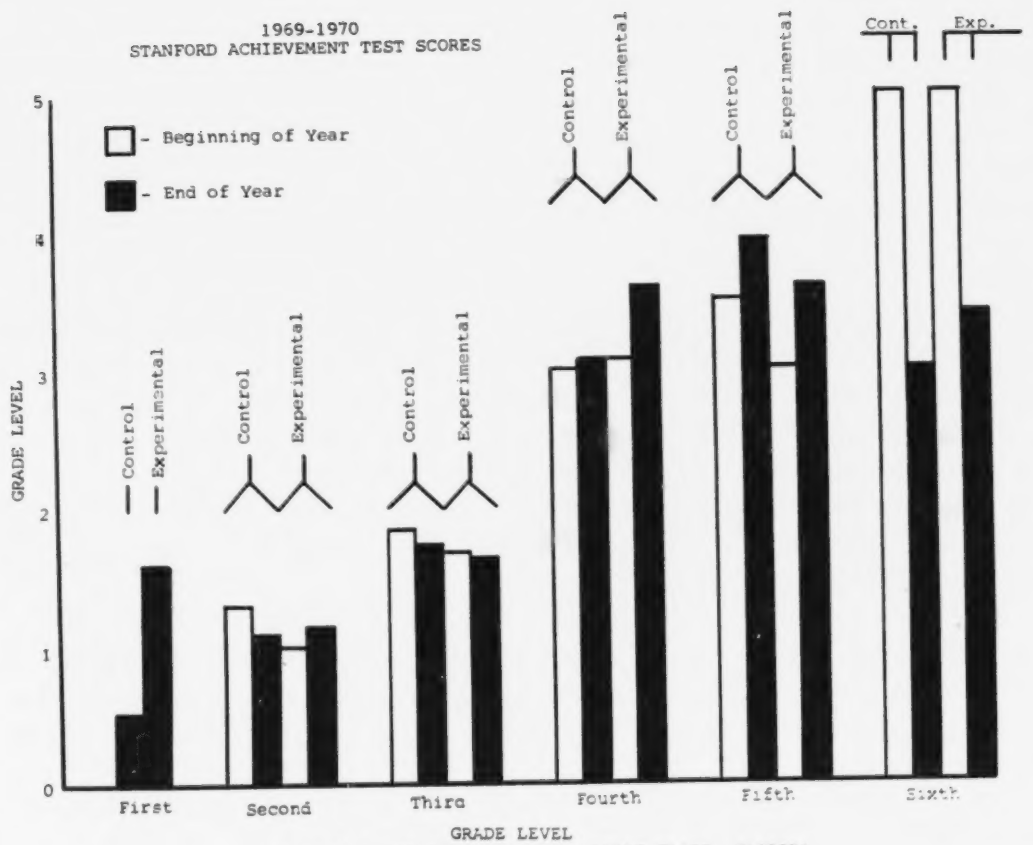
Figure 12

Story written by same student
at end of Spelling Program.
April 1970.

Stanford Achievement Test

The use of the Stanford Achievement Test to measure the success of the program is considered a secondary check on the achievement of the program for the reason that the tests were not supervised by N-VC personnel and control of their administration is open to question. Despite these shortcomings the results tend to confirm the findings presented in the Story Writing Section.

The Stanford Achievement Test Results for each grade level are presented in Figure 13. Each experimental class is compared with the control class that appeared most closely equated in ability on the basis of beginning-of-year tests. In grades two through six, the beginning-of-year comparisons were on the basis of the Stanford Achievement Test as were the end of year comparisons. This was not possible in grade one as a reading readiness test was given at the beginning of the year. In the case of grade one, scores were analyzed on the basis of the control group most nearly equated on the reading readiness results. The Stanford Achievement Tests are presented for the end-of-year results for grade one. Each bar on the graph indicates an average over a class for the entire area of language arts tested, i.e., word meaning, spelling, paragraph comprehension. All experimental groups show a gain in Stanford Achievement Test score beyond that of comparable control classes. However, a more significant measure of accomplishment consisted in the analysis of stories gathered from the children, because of the rigid control possible within this experimental pattern. In the case of the Stanford Achievement Tests, the computer analysis of the scores, the lack of a suitable beginning of year test for grade one, made the task of individual matching of students an insurmountable task for the present research team. The graph therefore represents class averages without regard to students who left or entered the program, and whose benefits from the program would be dubious. The sizeable drop from beginning to end of year in both experimental and control groups in grade six also casts some doubt upon the validity of the Stanford Achievement Test as an accurate measure for evaluation of the experimental population.



LAKE SHORE ELEMENTARY SCHOOL, BELLE GLADE, FLORIDA

Figure 13.

DISCUSSION AND CONCLUSIONS

The overall effect of the arts spelling program on the experimental classes was one of increasing the number of student attempts at composition while decreasing errors. The employment of the arts as a teaching medium appears to enhance the motivational involvement of the child and results in improved effectiveness in learning. The performance of the experimental classes was in sharp contrast to that of comparable control classes being taught through conventional methods.

To what degree the peer proofreading contributed to the final success of the spelling program cannot be ascertained from the present study. It would seem, however, that it must have been a significant factor since this process, of necessity, brought about school unification via intergrade peer-to-peer communication to an extent not seen heretofore. Proofreading served to guide each child in the techniques of both self evaluation and beneficial criticism.

The story writing analysis, used in the present study to evaluate the overall program, could serve as an invaluable diagnostic tool for the teacher. Not only could the class as a whole be assessed for the year's progress and the teacher note weaknesses to be emphasized and corrected the following year, but the same analysis could point to difficulties encountered by the individual child. This very useful type of evaluation is not possible with most standard tests given throughout the United States.

The spelling program was oriented toward the peer-produced book. From the inception of the program students at all levels were encouraged to become authors. From the creation of simple sentences and drawings at the beginning they moved to writing and illustrating their own books at the end of the year. These books were laminated and bound and placed in the library. It is impossible to measure, but observers could not mistake the pride in achievement and creation that developed in these young authors as they wrote books that were eagerly read and understood by their peers.

Perhaps the most important result from the present study is the strong support for the assumption that teaching through the arts is an approach that can be successfully used by all teachers at all grade levels. Specific teacher training was not employed, and could not, therefore, have been an absolute necessity. The arts have always been associated with emotional and motivational involvement, and all the teacher really needed was the concept and, at the outset, some professional guidance. Finally, the economy of using the arts as a teaching medium is of great significance. The child, supplied with paper, pencil and crayon, can be an artist in his own right, achieving nonverbal communication to rival the most advanced technology.

REFERENCES

Bishop, I.E. The comparison of a conventional method of teaching spelling with a method emphasizing proofreading as an integral part of a spelling program. Eric. Research in Education, 1969, 4, 108.

Bradley, R.C. Traditional spelling doesn't do the job. Minnesota Journal of Education, 1965, 46, 25.

Dailey, W.D. A study of the effect of selected lessons in syllabication on achievement in spelling at the fourth grade level when the words are presented in visual and oral syllabic form. Dissertation Abstracts Section A, The Humanities and Social Sciences, 1967, 27, 3361-3362.

Hillerich, R. L. A spelling/writing project becomes an English program. U.S. Department of Health, Education and Welfare, 1967, 1-7.

Hodges, R. What's new in the area of spelling; National Education Association, Washington, D. C. 1966.

Horn, E. Teaching spelling. National Education Association, 1967, 2-24.

Personke, C. and Knight, L. Proofreading and spelling: a report and a program. Elementary English, 1967, 44, 768-774.

Travers, R. W. Van Wagenen, R.K., Haygood, D.H., and McCormick, M. Learning as a consequence of the learner's task involvement under different conditions of feedback. Journal of Educational Psychology, 1964, 55, 167-173.

APPENDIX C

MEASUREMENT

INSTRUMENTAL TEST OF RESPONSE TO AUDIO AND VISUAL STIMULI AND TO AN ENTERTAINMENT PROGRAM

During the eighth quarter three major test series were undertaken in the laboratory. The first test series sought a correlation between a subject's stated response to audio-visual stimuli and encabulator read-out. A correlation was achieved.

Test methods are outlined in Test I-A and I-B; test results are shown in Figures 1, 2 and 3.

FIRST TEST SERIES

TEST I-A

Problem: To demonstrate the correlation between stated and encabulator measured response to auditory stimuli.

Equipment: Encabulator Mark III consisting of radiation sensor and chair with built-in sensors to measure movement, attitude and muscular tension.

Procedure: Eighteen subjects were seated in the test chair twelve feet from the radiation sensor. The opening one and one-half minutes of each of six pieces of music chosen for variety in emotional content were played under identical conditions of presentation. Subjects then identified the selections which they would like most and least to hear in their entirety. Encabulator read-out tapes were analyzed to determine the amount of response for each selection.

Observation: Tape analysis showed a close correlation between stated preference and measured response. The response measured by the encabulator varied in amplitude with the degree of presumed emotional content of the selection.

Conclusion: An emotional experience of a subject appears to produce an identifiable signature on the encabulator read-out.

Correlation Between Subjects' Stated Like and Dislike of Specific Musical Selections and Measured Response to Those Selections

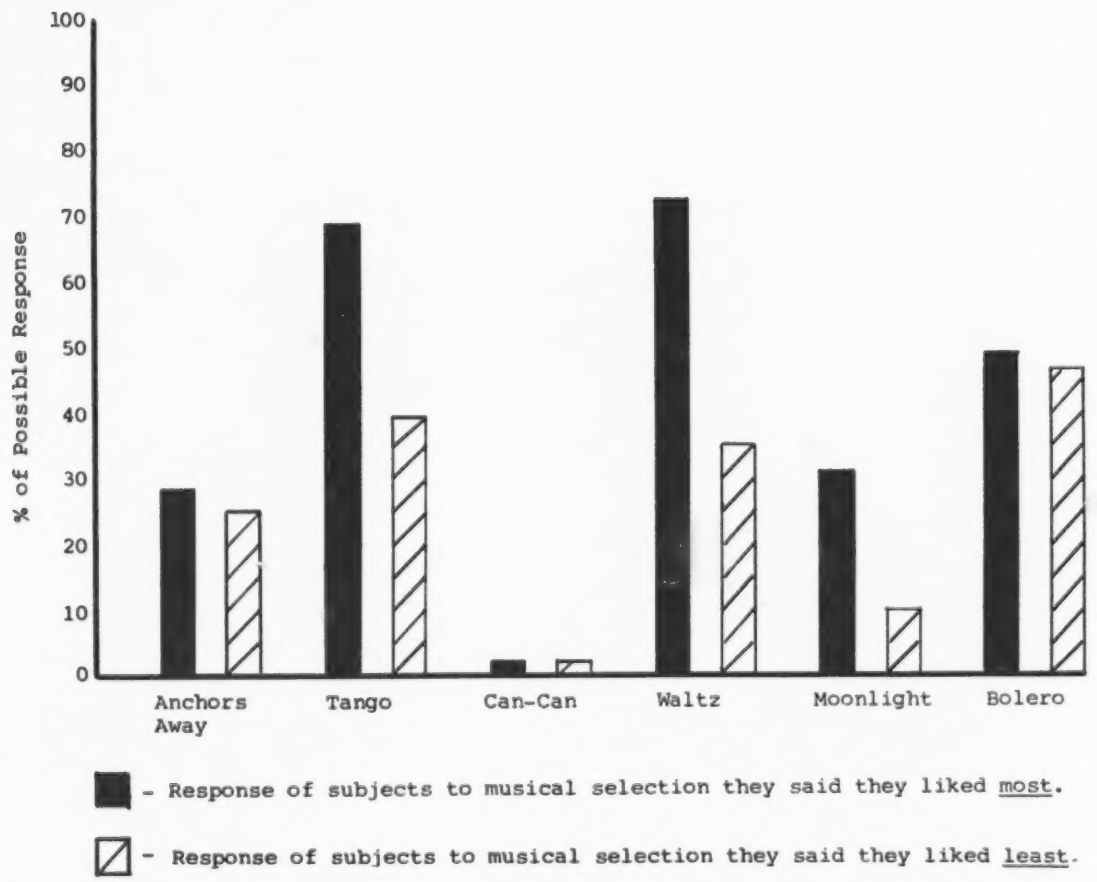


Figure 1.

TEST I-B

Problem: To demonstrate a correlation between subjects' stated preference for music or pictures and measured response.

Equipment: Same as in Test II.

Experimental Procedure: At the conclusion of Test I, eighteen subjects were shown a series of twenty-three (23) pictures chosen with a view to inducing a variety of emotional reactions (horror, amusement, etc.).

Observation: 1. Encabulator tape read-outs constituted identifiable signatures. 2. Response to music was greater than to pictures, even with subjects who preferred pictures.

Conclusion: Encabulator measurement of response of subjects can provide pre-tested stimuli for use in preparing many presentation forms.

Correlation Between Subjects' Stated Preference for Music or Pictures and Their Measured Response

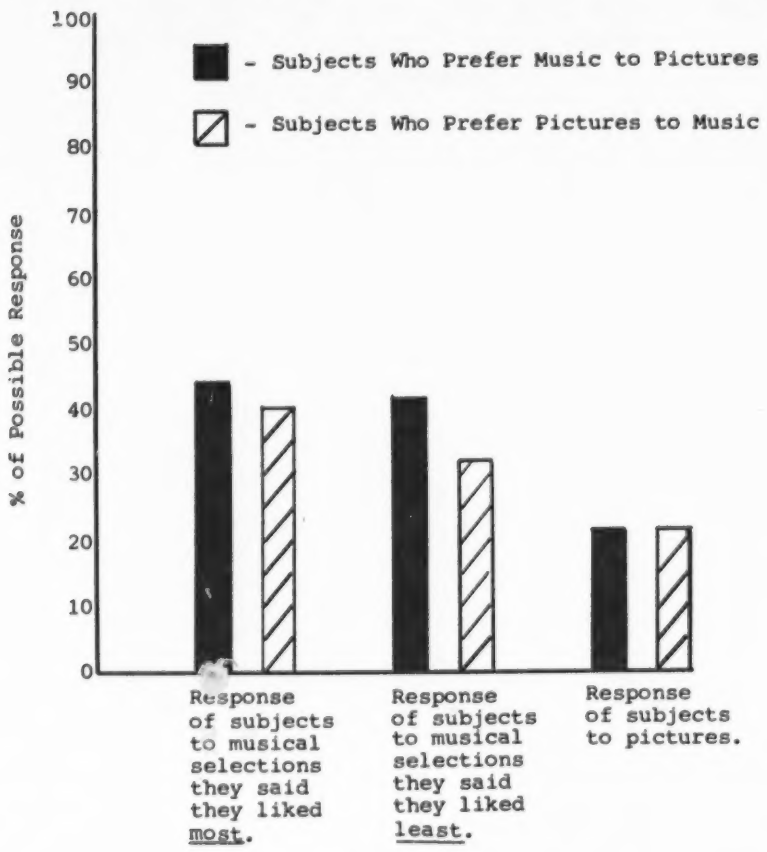


Figure 2.

Correlation Between Subjects' Stated Preference for Music or Pictures

and Their Measured Response

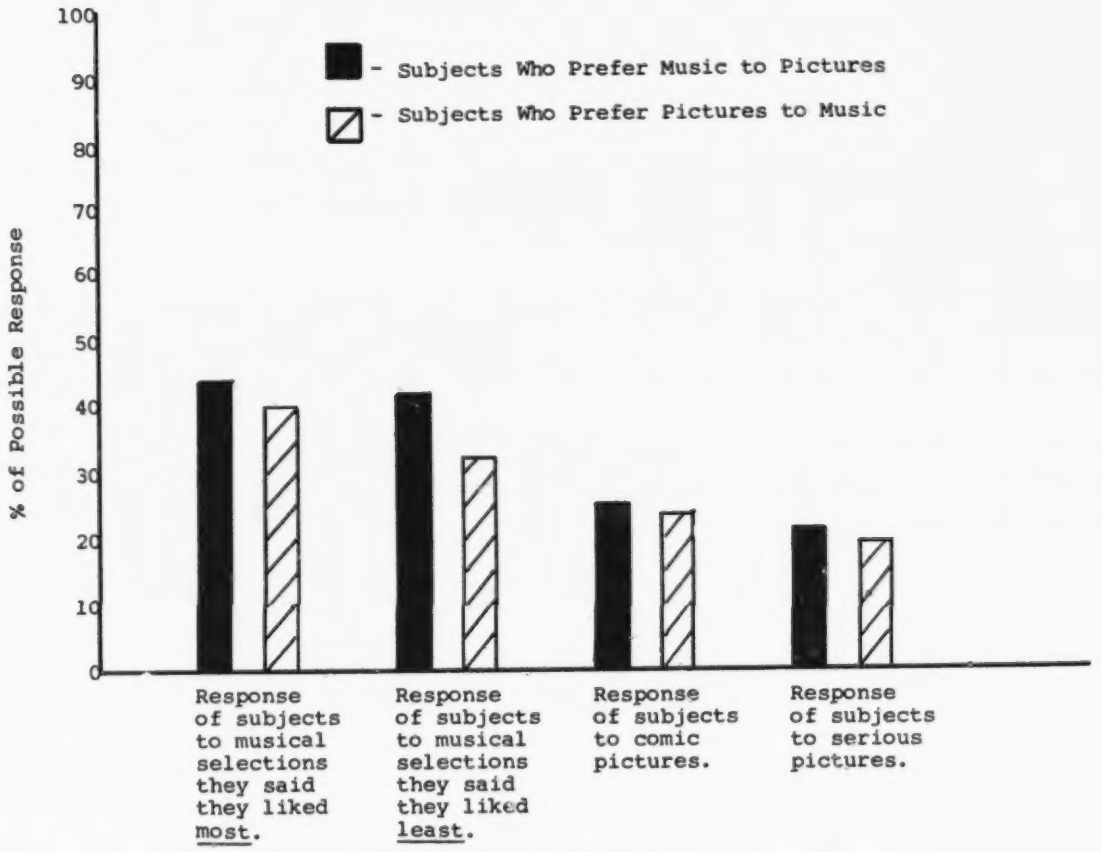


Figure 3.

SECOND TEST SERIES

The second test series sought through replication to confirm the findings of the first series. Methods and conditions remained the same with two exceptions:

1. The presentation sequence of the stimuli was reversed, i.e. slides were shown before music.

2. In addition to the equipment of the first test series, a camera equipped with a telephoto lens and modified with a photo electric cell at the image plane and a red pass filter was focused on the subject.

As in the previous test, read-out tapes from the encabulator radiation sensor and the camera were analyzed. The tapes from the encabulator chair have not, to date, been analyzed.

Results from this series, compared with results from the first series, are shown in Figures 4 and 5. The sought-for replication of findings was not immediately achieved, however, these results should be considered inconclusive in that read-out data from the chair needs to be analyzed and combined with the read-out from the radiation unit. This would exactly replicate the read-out analysis from the first series. This was not done initially because chair read-out from this series on preliminary investigation appeared less significant than the read-out from the camera sensor.

Correlation Between Subjects' Stated Preference for Music or Pictures and Their Measured Response

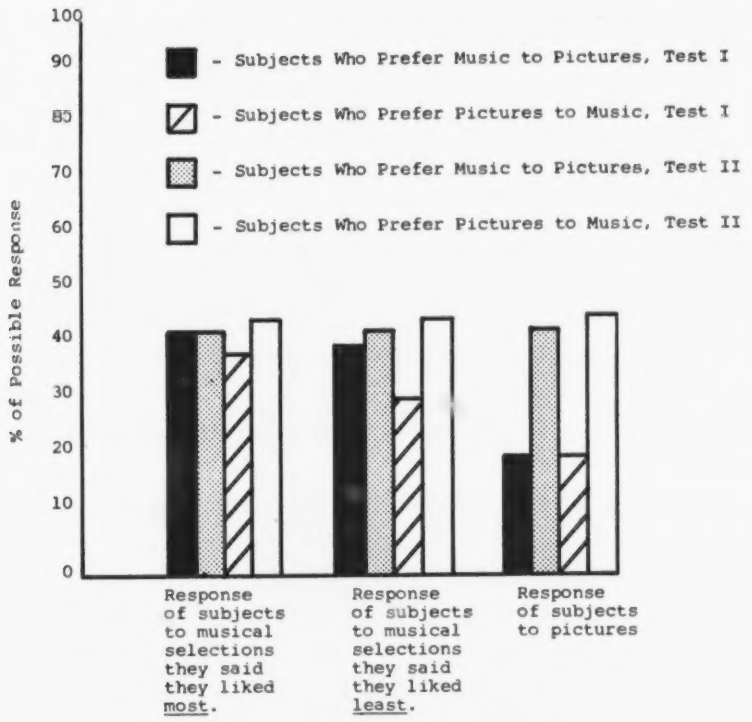

100
90
80
70
60
50
40
30
20
10
0
% of Possible Response
- Subjects Who Prefer Music to Pictures, Test I
- Subjects Who Prefer Pictures to Music, Test I
- Subjects Who Prefer Music to Pictures, Test II
- Subjects Who Prefer Pictures to Music, Test II
Response of subjects to musical selections they said they liked most.
Response of subjects to musical selections they said they liked least.
Response of subjects to pictures

Figure 5.

Correlation Between Subjects' Stated Like and Dislike of Specific Musical Selections and Measured Response to Those Selections

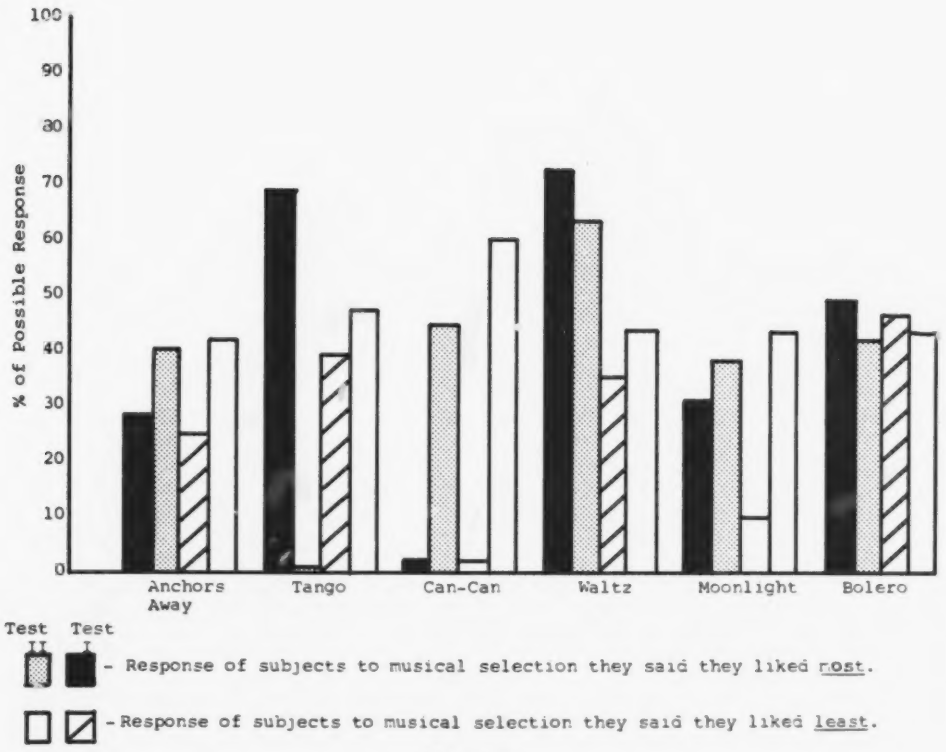


Figure 4.

THIRD TEST SERIES

The third, and final, test series was similar in all but one respect to the previous two. The major difference was a change in stimuli to a half-hour network television program taken from video tape.

The purpose of this series was to apply experience and findings from the previous tests to a different set of stimuli.

Equipment and procedure remained the same as in Test Series II.

The test program, a pilot production for a network suspense-drama series, was broken into two major segments. The first segment acted as a control and consisted of the opening two-thirds of the program. The content of this part of the program was primarily expository. The final third of the program contained a suspenseful scene and became the test section. Read-out tape analysis consisted in comparing a subject's response to the expositional material to the suspense material. A questionnaire prepared by the network Program Analysis Department was completed by each subject after seeing the film.

The quarter ended before a significantly large sample could be tested (N=7). Anticipated differences in read-out between expository and suspenseful episodes were not marked. However, a number of unexpected phenomena were noted which need further study when this test series is resumed, e.g.(1) the young subjects (under 25 years) responded slightly less (2-3%) than the older subjects (over 40) (2) the average response of all subjects to the film was closely related to the percent of subject's response to the slides in the previous two test series (25% range).

CONCLUSIONS

1. The encabulator has produced signatures which correlate with the stated response of the subject to visual and auditory stimuli.

2. In its present state, with trained personnel, encabulator techniques can be used to provide instantaneous and continuous measurement of a subject's response to stimuli. In order to use these techniques to test the effectiveness of lesson and entertainment programs, controlled experimentation must be undertaken in the classroom and theatre.

3. From the correlation obtained in the first test series, it appears that audio stimuli are more effective than visual stimuli in inducing a measurable response. This could help to explain the child's desire to listen to the recorded story while reading the peer produced book.

4. The read-out has so many characteristics which are subject to study e.g. frequency, direction, degree of slope, amplitude etc., that computer study will be required for a complete interpretation of the information which is presented.

For complete understanding of the information presented, the encabulator response must be studied along with polygraph read-outs, electro-encephalograms and other indicies of emotional state, change and rate of change. The similarity and differences in read-out must then be studied to further define or confirm the significance of the encabulator read-out.

SEVENTH INTERIM REPORT

PROJECT NO. 7-0646

GRANT NO. OEG-4-8-070646-0021-007

AMENDMENT NO.2

AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION

Harold Burris-Meyer
Florida Ocean Sciences Institute, Inc.
604 Park Drive
University Park
Boca Raton, Florida 33432

MARCH 1970

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TABLE OF CONTENTS

		Page
I.	INTRODUCTION AND SUMMARY	1
II.	OPERATIONS AND METHODS	1
III.	EQUIPMENT DEVELOPMENT	8
IV.	PROJECTED PROGRAM	9
V.	CONCLUSIONS	10
	REFERENCES	
	APPENDIX A Personnel	
	APPENDIX B Figures 1, 2, 3 and 4	
	APPENDIX C Photograph	

I. INTRODUCTION AND SUMMARY

During the seventh quarter, laboratory and field testing continued. Field test programs investigating the use of the arts in teaching as outlined in the Sixth Interim Report are ahead of schedule. Currently thirty-three students from the College of Education, Florida Atlantic University, are working on these projects in eighteen schools from elementary to college in Broward and Palm Beach Counties. Work has begun on generalizing the findings from these studies into parameters and checklists for using non-verbal communication in teaching. through the arts.

The Mark III Encabulator was received, tested and proven to be the most sensitive device available to N-VC at the present time. Specifications for a super-sensitive Mark IV have been drawn. Construction of this device is not planned at this time. On recommendation of our consultant on vascular activity we are measuring radiant reflectance of the skin in the 450 to 700 millimicron range. We hope thereby to avoid the signal distortion from ambient temperature which makes reading the Mark III difficult.

Operating economies have made it possible to extend the Project from 30 April, contract expiration date, to 30 June at no additional cost. Request for amendment to the contract to provide for extension has been made.

II. OPERATION AND METHODS

NO COST EXTENSION OF PROJECT

Economies effected over the past ten months through having some expenses met by other organizations; savings in travel, salaries, and administrative budget, indicate that the project can continue at no cost to the government for two months beyond the contracted expiration date of 30 April 1970. This expectation is based on an analysis of average costs over the past ten months. A request has been forwarded for advancing the expiration date to 30 June. The advantages of this extension are twofold. First, test results of many of our field studies will not be available to us until late May and time is necessary to analyze these results and prepare them for publication. Second, a 30 June expiration date would put a continuing project in step with the Federal fiscal year.

LABORATORY TESTING

During the quarter two series of tests were administered in the N-VC laboratory to a total of 50 subjects. Each test consisted of a series of short, popular music selections and groups of slides chosen to elicit a serious and a comic response. Encabulator radiation sensor and chair read-out data were taken on all subjects. Each read-out tape was "read" and a numerical value assigned to the tracings at five millimeter intervals. These values were then subjected to statistical analyses.

The purpose of the two test series were: (1) to discover a correlation between the subject's signature on the read-out tape and his emotional responses to the stimuli as indicated by written responses to a questionnaire; (2) to evaluate a variety of strain-guage patterns applied to the encabulator chair and; (3) to test and evaluate the Mark III encabulator by correlating its response to responses obtained from a temperature probe applied to the subject's face.

Results of the test series indicated: (1) that while no significant statistical correlation was found in relating stimuli to written and encabulator responses, these tests provided N-VC staff with greater understanding of the movement signature of subjects under musical and visual stimulation; (2) the use of a variety of strain-guage patterns on the encabulator chair is indicating the optimum arrangement to provide a decisive movement signature relative to amplitude and direction of movement; (3) the check-out of the Mark III encabulator in correlation with the skin probe and in consultation with our consultant familiar with vasomotor activity suggests that vasoconstriction in the face is of insufficient amplitude to be significantly practical for utilizing present encabulator models for field testing.

PSYCHOLOGICAL STUDIES

The progress of all current research in using art forms as a teaching medium is proceeding as projected in the last report. None of the results are in complete form, but all individual projects are moving at faster than predicted rates.

The greater portion of the research that has been undertaken by N-VC staff is discrete as to investigation and results. The particular problems that we are investigating, however, are believed necessary to circumvent the stumbling blocks encountered at the beginning of most methodological advances. In our basic overall plan to teach via the arts, we are first questioning the discrete non-verbal parts of the art itself. If the individual parts - i.e., color, spatial arrangement, audio presentations - augment the emotional, motivational, and intellectual processes of the student, then continued research into the use of the arts is deemed not only necessary, but should lead to heretofore unrecognized innovations in the technology of teaching.

PEER ORIENTED SPELLING PROGRAM (Lake Shore Elementary School, Belle Glade, Florida). As projected in the Sixth Interim Report, the College of Education at Florida Atlantic University has supplied thirty-three graduate and undergraduate students to work with the N-VC staff, and six of these students are now assigned to preparation of spelling lesson plans. Pre-experimental data (Stanford Achievement Test scores and spelling error analyses of Need Achievemtn stories) are now in graphical form awaiting end of year testing for comparative analyses. Peer written and illustrated books are being laminated and placed on special shelves in the school library. The upper grades at Lake Shore Elementary School are editing a peer-poetry anthology that will represent poetry written by children of all grade levels one through six. Several of the experimental classes are writing and producing their own skits that will be filmed for use by the school. Several slide/tape shows are being made of the children's peer-produced short stories and poetry. These techniques employing numerous art forms represent the N-VC generalized approach to teaching through the arts.

AUDIO LECTURE FACTORS IN STUDENT LEARNING-RETENTION Following the pilot study outlined in the Sixth Interim Report, N-VC personnel have recorded several audio versions of the same slide/tape lecture to test for varying effects upon student learning-retention. It has been shown (Fairbanks,1940) that there is audience sensitivity to emotions conveyed by lecturers. Audio style has also been found to influence attitude change (Dietrich, 1946). Results from previous researchers suggest that mode of verbal delivery does effect learning; however, even relatively recent studies such as that of Coats and Smidchens (1966) have usually imbedded the audio factor within other variables as speed of delivery, eye

contact of speaker, and sound level. The present N-VC study has only the audio style as a known variable. Audio and visual content, speed of delivery, and level are constant for all groups tested. Eight classes of education students at Florida Atlantic University and eight senior classes at a local high school are being tested with a ten-item multiple choice test following each version of the taped lecture pertaining to an art gallery. The tests are being given immediately after the slide/tape presentation and one week later. Four different modes of audio narration of the same verbal content have been recorded by a male, and the same four by a female: 1) normal-interested lecturer; 2) illogically phrased; 3) indifferent; 4) contemptuous. These are being used in testing for differential effects upon learning retention.

NON-VERBAL RESPONSE TO COLOR Rosenberg, Langer and Stewart (1969) found that congruent color matching with postural-gestural representations were significantly more easily learned by adults than non-congruent color-figure pairs. It was assumed by N-VC that this was a learned phenomenon, and if so, would show progressive changes from childhood to adulthood. Third and sixth grade children have been tested at present, and there is no indication of the expected progression. Our results are presented graphically in Figure 1. The original results from the Rosenberg, et al. study are included for comparative measures. It may be noted from these data that non-congruent color matching appears to result in faster learning for both groups of children. We are now testing first-grade students, but the completed results are not available. We have decided to test ninth-grade subjects next, and if the adult trend is not found at that time, we will attempt a replication of the original Rosenberg, et al. study with adult college students. If the original assumption of developmental changes in color meanings were supported, it would certainly imply a serious consideration of color-context pairing with children, whether this be in textbook presentations of ideas, or mood expression in theatre. We cannot make this generalization of course, if the hypothesis remains unsupported, or if we are unable to replicate the original results.

ATTENTION-RETENTION INCREMENT AS A FUNCTION OF NON-VERBAL FACTORS Several studies have been undertaken by Florida Atlantic University students under the supervision of N-VC personnel, which pertain to release of memory decrement following continued input of subject material. There is little doubt that ability to recall is impaired over a short

period of time if we continue to study the same type of material (Keppel and Underwood, 1962; Wickens, Born, and Allen, 1963; Loess, 1967). N-VC is attempting to discover those nonverbal factors that will act to release the build-up of this proactive inhibition. The paradigms employed for testing are essentially those currently in use by Dr. Delos Wickens and his colleagues at The Ohio State University. Although other researchers have been primarily concerned with adult subjects, N-VC is directing attention to memory processes of children, and improvement thereof in the classroom.

A. Switching Between Words and Arabic Numerals: We have completed the testing in grades one through six with disadvantaged children in the Florida Glades area (see Figure 2). We found the expected drop in performance following continued study of either words or numerals. There was, however, an immediate increase in recall ability when children were presented with a change in subject matter, regardless of which change was incorporated, words to numerals or numerals to words. The same experimental design is now being tested with a more privileged group of children at Smith College for comparative measures. These results, of course, support the change of subject matter within the regular school day.

B. Background Color Change: The results from testing at the first, second and fifth grade levels are shown in Figure 3. In this study, the same Arabic numerals were used as those incorporated in the previous study. In this case, the subject matter was not changed, but the background color on which the numerals were presented was changed after a period of student study. The color change was either from white to black, or from black to white. Testing has been completed with the first, second and fifth grade students, and in each case results show a release of memory interference. In other words, ability to recall was decreasing as more and more of the same material was being studied - immediately following a background color change, however, the performance of the student in recalling the same quantity and type material increased to within ten percent of initial performance level. If these results may be generalized, and we believe that future research will indicate this to be true, implications for instructional methods, (i.e., teaching via art forms) are vast. Color in textbooks, and in all visual material, designed according to our findings, could greatly facilitate the learning progress of each chlld. Investigations into optimal amount and hue value and chroma of color are part of our projected program.

C. Male-Female Voice Switch: Since the previous results indicated that doing nothing more than changing the background color of visually presented material could significantly facili-

tate student performance once it had started to decline, we decided to try an analogous approach with audition. In this study we aurally present material to students, and at a point where performance is poor relative to initial performance, we switch the voice from male to female or from female to male. If the voice switch functions aurally as the background color switch did visually, we would expect student performance to increase immediately following the switch. The study is in progress and we have no indicative results at present; however, these results could be highly significant for "team teaching" in particular, if it is found that presenting material by two different instructors has the effect of maintaining memory at a high level.

EFFECTS OF REPETITION ON MEMORY (Ranschburg Effect) The Ranschburg Effect appears when poor recall results from the learning of lists containing repeated items (Jahnke, 1969; 1969a). Not only the repeated items but the entire list containing the repeated items seems to be affected adversely. Since there are repetitions within materials presented in the classroom, and Ranschburg originally proposed that the phenomenon was quite general, even influencing spelling and writing, N-VC is attempting to find non-verbal factors that might reduce the interference set up via repeated items. At the same time, we are attempting to discover how the introduction of the same non-verbal factor will effect the reversal phenomenon. This reversal is the enhancement of learning that occurs under circumstances similar to those of the Ranschburg type research in which the repeated items within a list are spatially closer together. If "actual" spatial separation of items (by inserting other items between repeated items) can either enhance or retard learning performance, what will be the effect of introducing a non-verbal factor to bring about "apparent" spatial separation? At present, we have results from the first grade level (Figure 4), and these children learned lists with repeated items better than comparable lists containing no repetitions (which was expected due to the items being closer together). These results seem to hold regardless of the addition of the non-verbal factor: however, there is a definite difference between the two methods of visual presentation (apparent vs. actual separation) with the same repeated items and the students' performance. When the non-verbal factor is used, performance on both repeated and non-repeated lists is more nearly equated. We do not have results, as yet, on how this same factor will effect learning that is ordinarily found to be more difficult. Testing is in progress with second and sixth-grade students, and also with adult subjects.

EFFECT OF AGE LEVEL IN THE LEARNING OF HOMONYMS The teaching of homonyms begins with second grade children in Florida, and it does not seem unreasonable to assume that this holds for a majority of state adopted texts throughout the United States. The teaching of homonyms, of course, must enter into instruction at some period of child instruction, but there is reason to suspect that introduction of such words would be better introduced with older children. The study by Riess (1946) supports this assumption, in that younger children (ages 7-9 years) showed significant generalization between matched homonyms; i.e., they perceived these words as the "same" regardless of meaning. Older children, however, indicated a progressive trend toward generalization of meaning. It is possible that the younger children simply do not perceive homonyms as physically different (they appear visually similar), and as a result, have more difficulty in differentiation. We are currently testing children at different age levels, and if the younger child indicates significant difficulty in visual perception of differences - if the words look alike to him - then we may actually be increasing the difficulty of learning by introducing material that could be more easily mastered by the older child. A recent study by Kausler and Olson (1969) showed that adult Ss have greater difficulty discriminating word lists containing homonyms than non-homonym lists, so it may be a fair assumption that discrimination of this material is difficult even at the adult level. If we find a significant increase in difficulty with children, beyond that which might be expected, it might be wise to withhold the introduction of homonyms at the lower grade levels. This study should provide developmental guidelines for the introduction of visual materials.

CONCLUSIONS FROM PSYCHOLOGICAL STUDIES The studies here briefly described chronicle our investigations into discrete aspects of the arts essential to their application in achieving built-in motivation in lesson presentation. These studies have also indicated other areas where basic information is still unavailable. On the basis of our findings to date we are better prepared to describe some of the artistic parameters in the emotional, motivational, and intellectual processes of the student. With these parameters, we can now approach the use of art forms to achieve emotional involvement in the subject with much greater certainty than was previously possible.

ANCILLARY OPERATIONS

A meeting with the faculty of the Henderson School, an experimental school administered by Florida Atlantic University, with grades K-9, resulted in N-VC being asked to use its equipment in evaluating aspects of the Henderson program. Working in the school is contingent upon results obtained from testing modified encabulators (see Section IV).

The Program Analysis Department of Columbia Broadcasting System has agreed to supply N-VC with pilot TV show for laboratory testing. We expect to receive the film in mid-April and will begin testing upon receipt.

Correspondence has been initiated with Dr. Vincent Cline at the University of Utah (Life, January 30, 1970) concerning his measurement of the emotional response of children to television violence. He has indicated a willingness to work with N-VC to correlate his findings with N-VC read-out.

In our desire to investigate the possibility of using N-VC techniques at all educational levels, the Project Director's Introductory Theatre Class at Florida Atlantic University produced three peer-produced movies and slide/tape shows. These were presented to, and evaluated by, the students of the class as a whole. Student response to this teaching approach appeared enthusiastic.

Production of a super-8 sound film was undertaken and is now being completed. Purpose of the film is to demonstrate before students, teachers and administrators the production and philosophy and effectiveness of the peer-produced reading book.

III. EQUIPMENT DEVELOPMENT

Airtronics has fulfilled its contract with N-VC by delivering a Mark III encabulator and the complete engineering report needed as a basis for the design of a Mark IV radiation sensor. To make possible the Mark IV design it was necessary to develop new thin film depositing techniques to make a sensor array. Materials were tested and processes developed by Melpar, Inc., Falls Church, Virginia. According to all data available, and based upon tests of two units of Mark III, a Mark IV sensor should permit the isolation of the desired signal from background radiation and

should minimize the effect of movement, two conditions whose existence has limited the reliability of earlier models. Budget limitations will not permit the construction of Mark IV during the present fiscal period.

Fragmentary photobiological data published during the 1920's in a Siemans house organ, since amplified, on vascular changes in various parts of the body and developed in the course of cancer research under the auspices of Dr. Frederick Urbach, consultant to N-VC, indicates that vascular changes in the face are much less pronounced than changes at the extremities. As a result, the radiation sensors can measure radiation from hands much better than the face and this phenomenon limits the use of the radiation sensor with an unwitting subject. Accordingly, it was postulated that the radiant reflectance of the visible portion of the spectrum would vary with direct correlation to vascular changes in the face and thus might prove to be a more sensitive and reliable measure of this change than infrared radiance. Accordingly a sensor was assembled to read in the 450 to 700 millimicron range rather than the 9.6 micron range of the Mark III sensor. Preliminary tests indicate that the line of reasoning thus far is correct and parallel tests with both sensors are under way. If these tests confirm preliminary observations, detectors in the shorter range may fulfill some of the requirements for which Mark IV was designed. The apparatus involved is simpler and less expensive than devices using the 9.6 micron wave length.

IV. PROJECTED PROGRAM

The field tests outlined in Section II will be completed during the eighth quarter. Data obtained from these tests will be analyzed and results prepared for publication. Results from all N-VC studies will be used in the amplification and refinement of checklists and parameters now in preparation for guiding educators in the use of the arts in teaching.

Laboratory tests using encabulator Mark II, with a new sensor in the 450 to 700 millimicron range and the chair equipped with sensors in various conformations will be continued in the laboratory testing the CBS pilot film and commenced in the field at the Henderson School.

The motion picture demonstrating aspects of N-VC techniques and several slide/tape shows completed and in the planning stage will be used for initial disclosure and dissemination of N-VC techniques.

V. CONCLUSIONS

Vis á vis the original projected five-year program the N-VC project has attained the major portion of its primary objective, of investigating the educational potential of non-verbal communication. It has demonstrated the effectiveness of well defined non-verbal components of various art forms in facilitating certain learning processes. In addition, the N-VC staff, employing its theatrical background and experience in all of the arts, has initiated a generalized approach directed toward pupil motivation. There are strong indications that end-of-year testing results will confirm the value of these motivational techniques in education.

Equipment has demonstrated in the laboratory its capability of detecting physiological concommitants of emotional change. Field application should be undertaken within another year.

The objective of refining and effectively disseminating the techniques here developed can be accomplished within a two year period, thus reducing the original time estimate by 20 percent and the required funds by somewhat over $100,000. Further refinement beyond the projected conclusion date 30 June 1972 can best be undertaken by activities having special needs, the basic general laws having been established.

REFERENCES

Coats, W. D. and Smidchens, U. Audience recall as a function of speaker dynamism. J. ed. Psychol., 1966, 57, 189-191.

Dietrich, J. E. The relative effectiveness of two modes of radio delivery in influencing attitudes. Speech Monographs, 1946, 13, 58-65

Fairbanks, G. Recent experimental investigations of vocal pitch in speech. J. acous. soc. Am., 1940, 4, 457-466.

Jahnke, J. C. Output interference and the Ranschburg Effect. J. verbal Learn. verbal Behav., 1969, 8, 614-621.

Jahnke, J. C. The Ranschburg Effect. Psychol. Rev. 1969a, 76, 592-605.

Kausler, D. H. and Olson, R. D. Homonyms as items in verbal discrimination learning and transfer. J. exp. Psychol., 1969, 82, 136-142.

Keppel, G., and Underwood, B. J. Proactive inhibition in short-term retention of single items. J. verbal Learn. verbal Behav., 1962, 1, 153-161.

Loess, H. Short-term memory, word class and sequence of items. J. exp. Psychol., 1967, 74, 556-561.

Riess, B. F. Genetic changes in semantic conditioning. J. exp. Psychol., 1946, 36, 143-152.

Rosenberg, B. G., Langer, J. and Stewart, J. Non-verbal learning. Am. J. Psychol., 1969, 82, 181-190.

Wickens, D. D., Born, D. G., and Allen, C. K. Proactive inhibition and item similarity in short-term ememory. J. verb. Learn. verbal Behav., 1963, 2, 440-445.

APPENDIX A

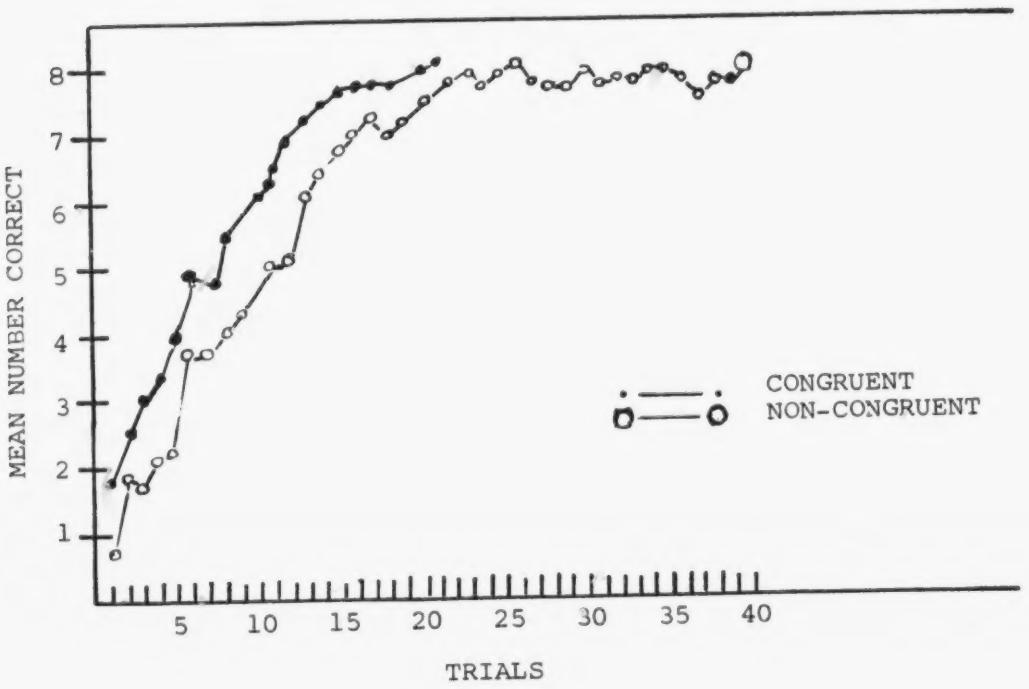
Personnel

Dr. Frederick Urbach
Director, Skin and Cancer Hospital
Temple University Medical Center
Philadelphia, Pennsylvania
Consultant

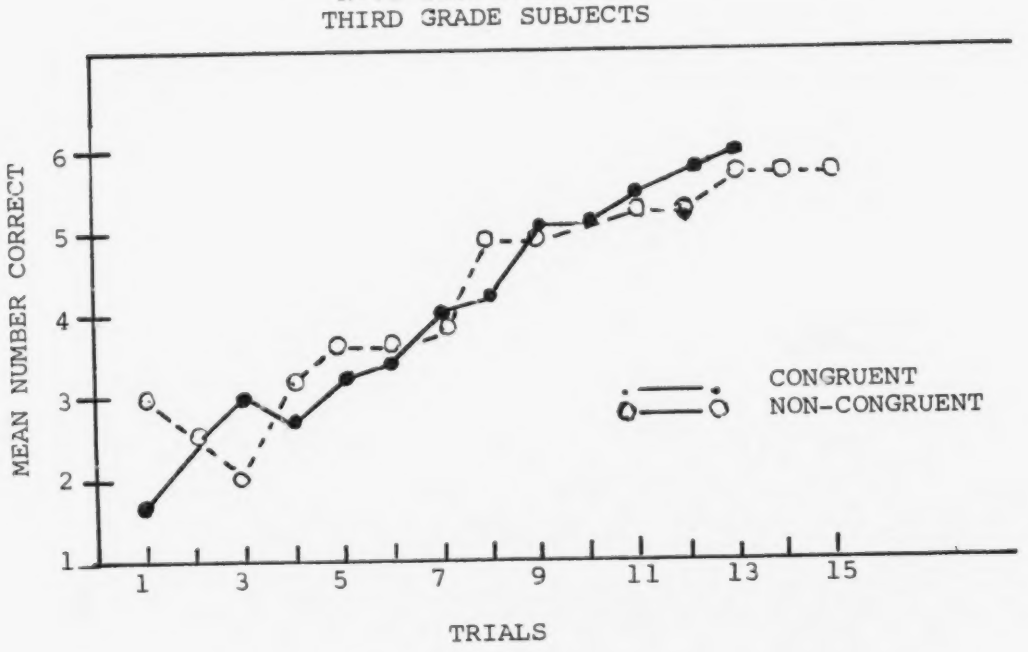
In : American Men of Science

N-VC Responsibility: Peripheral Physiology.

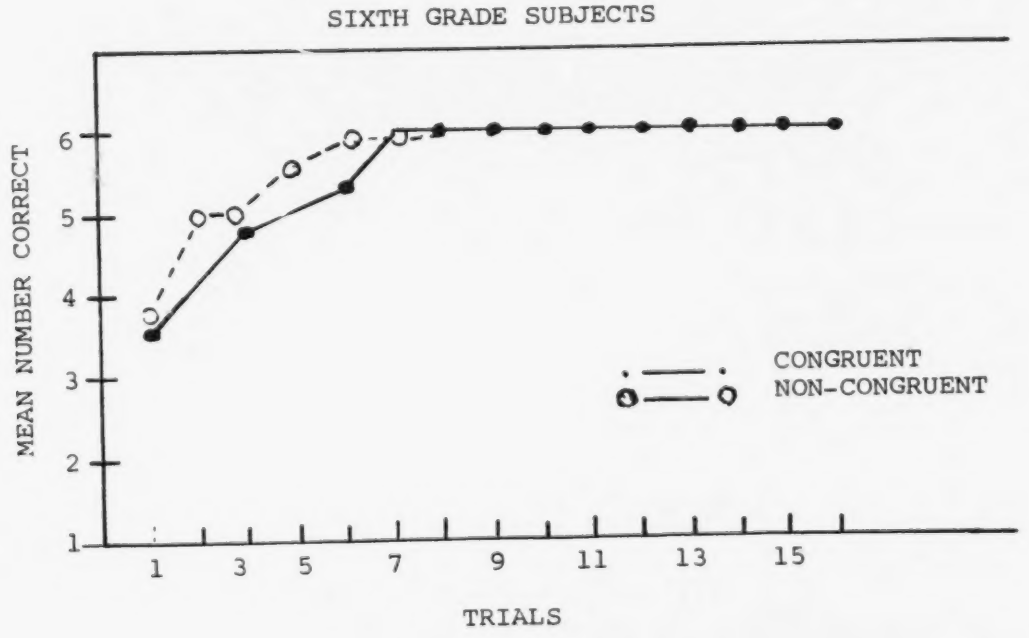
ADULT SUBJECTS
FROM ROSENBERG, LANGER, AND STEWART (1969; p.188)



N-VC TEST RESULTS
THIRD GRADE SUBJECTS



SIXTH GRADE SUBJECTS



APPENDIX B

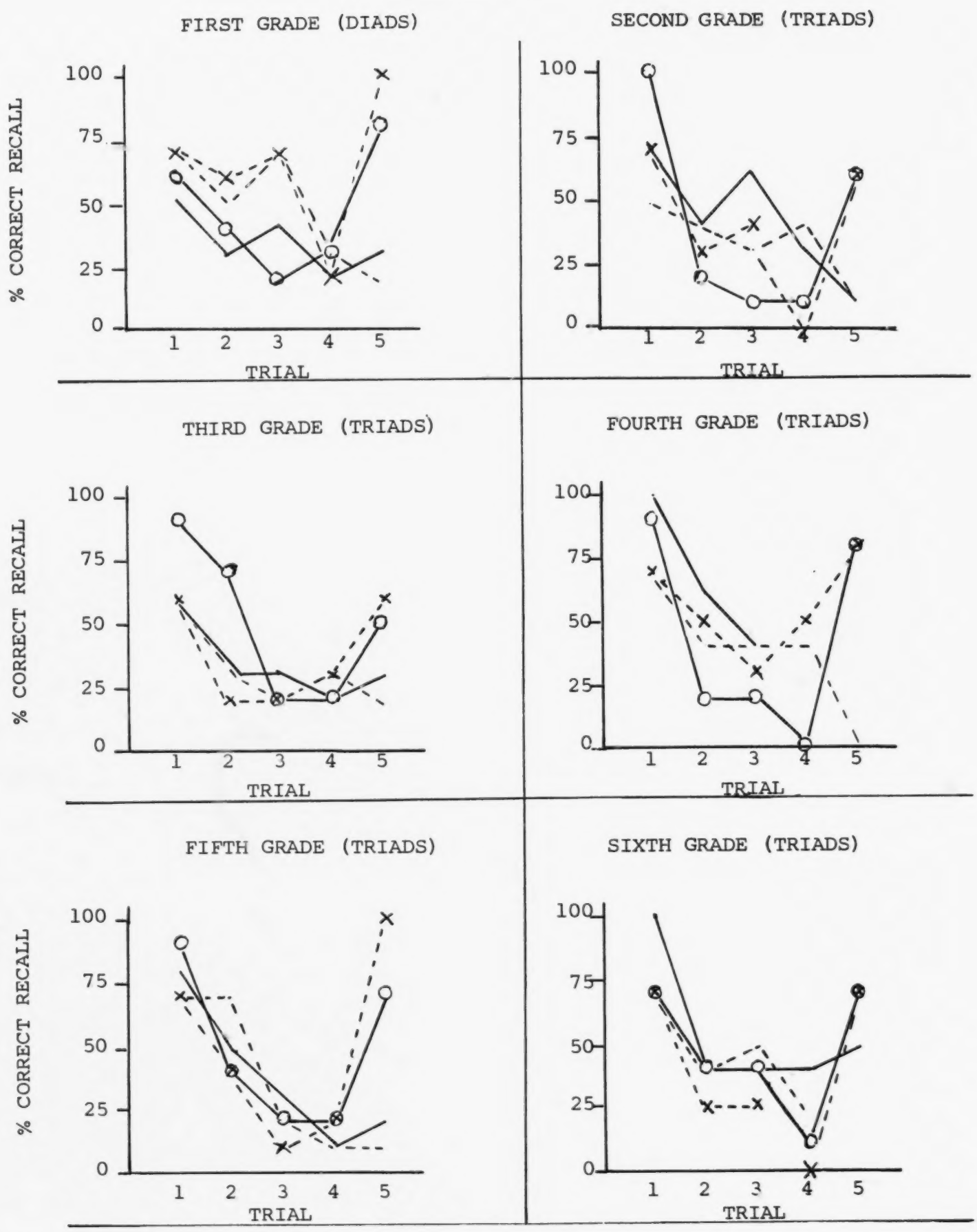


FIGURE 2 CONTEXT SHIFT

APPENDIX B

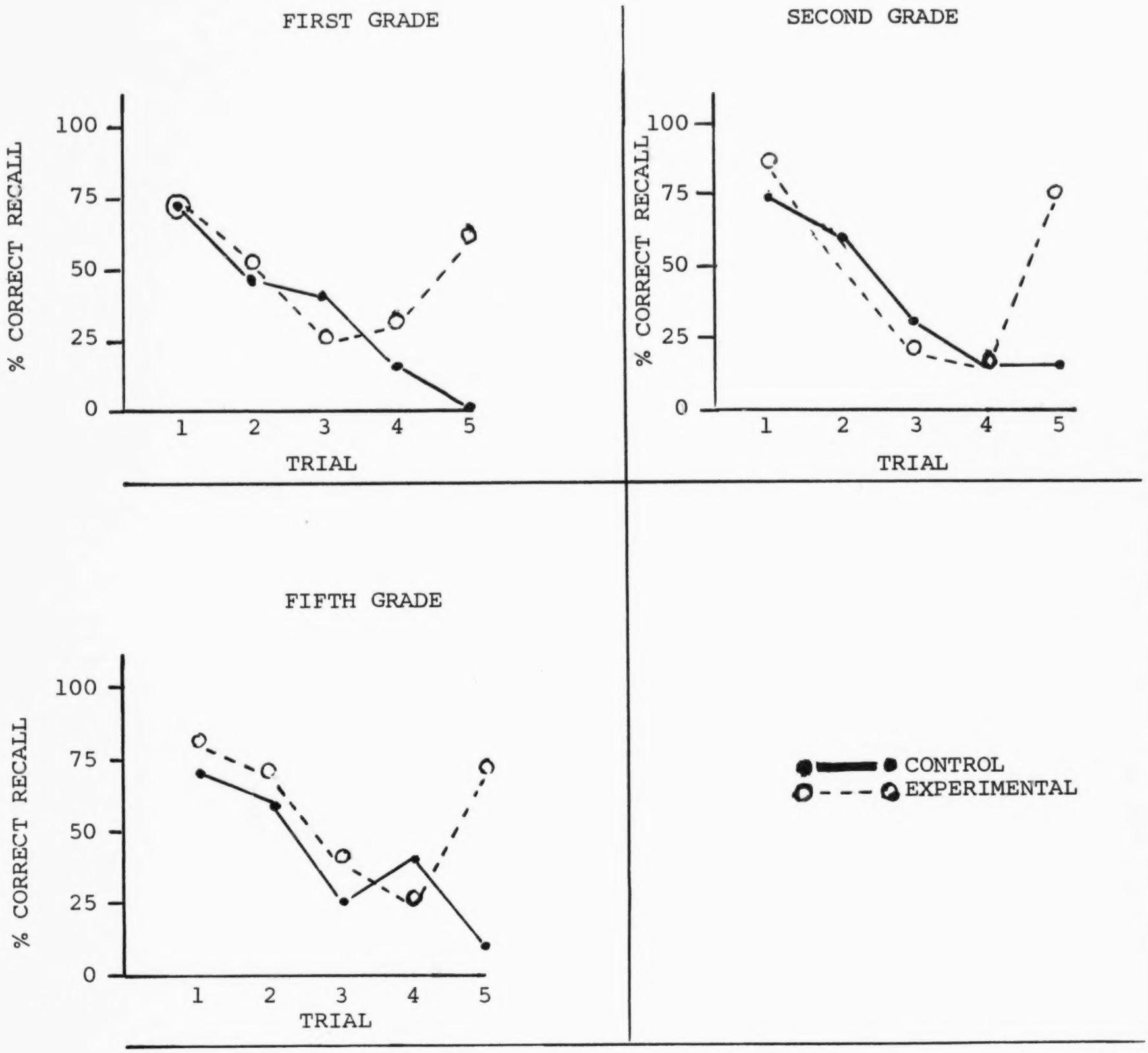


FIGURE 3. BACKGROUND SHIFT

White numerals on black background
and
Black numerals on white background

APPENDIX B

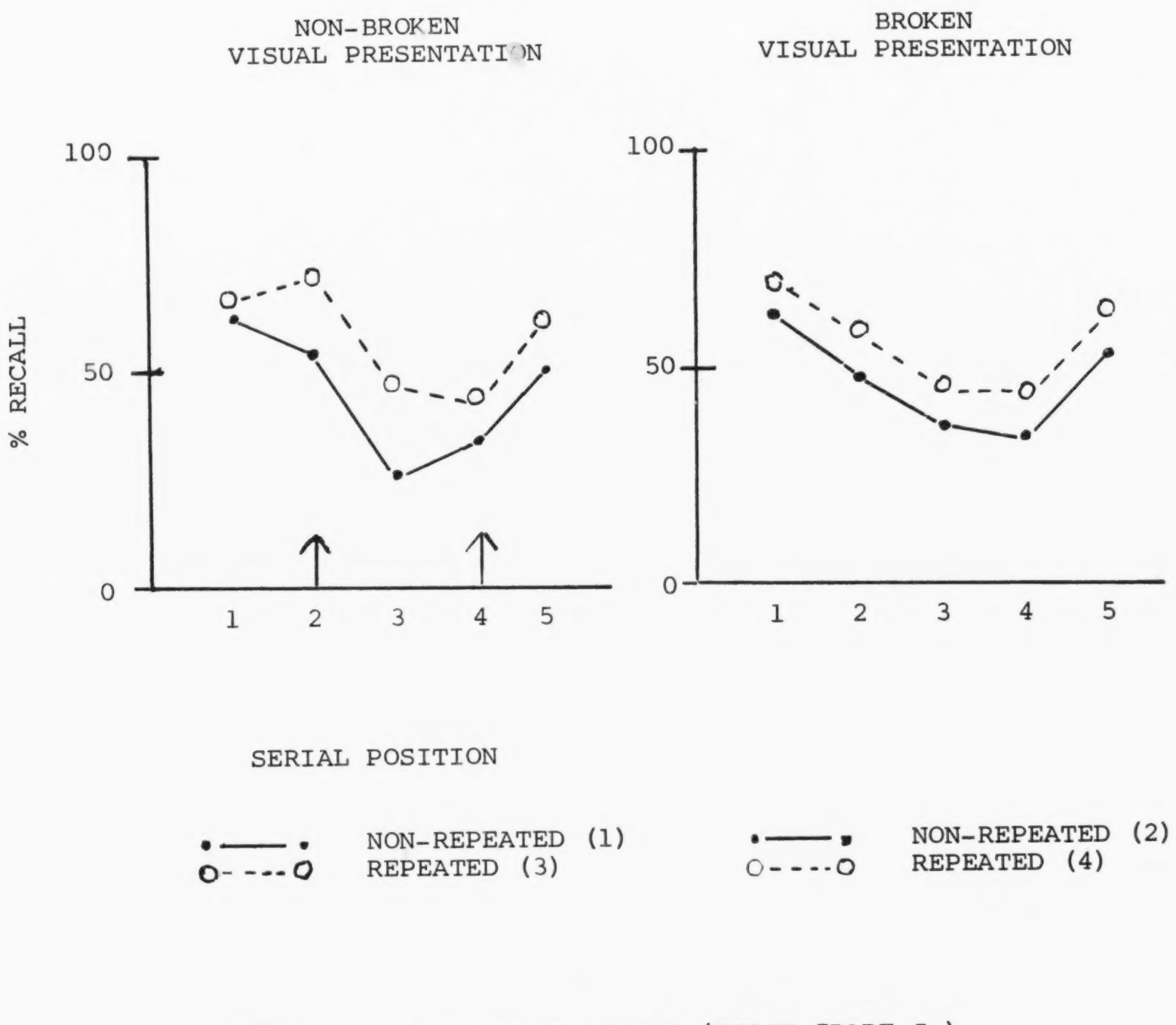
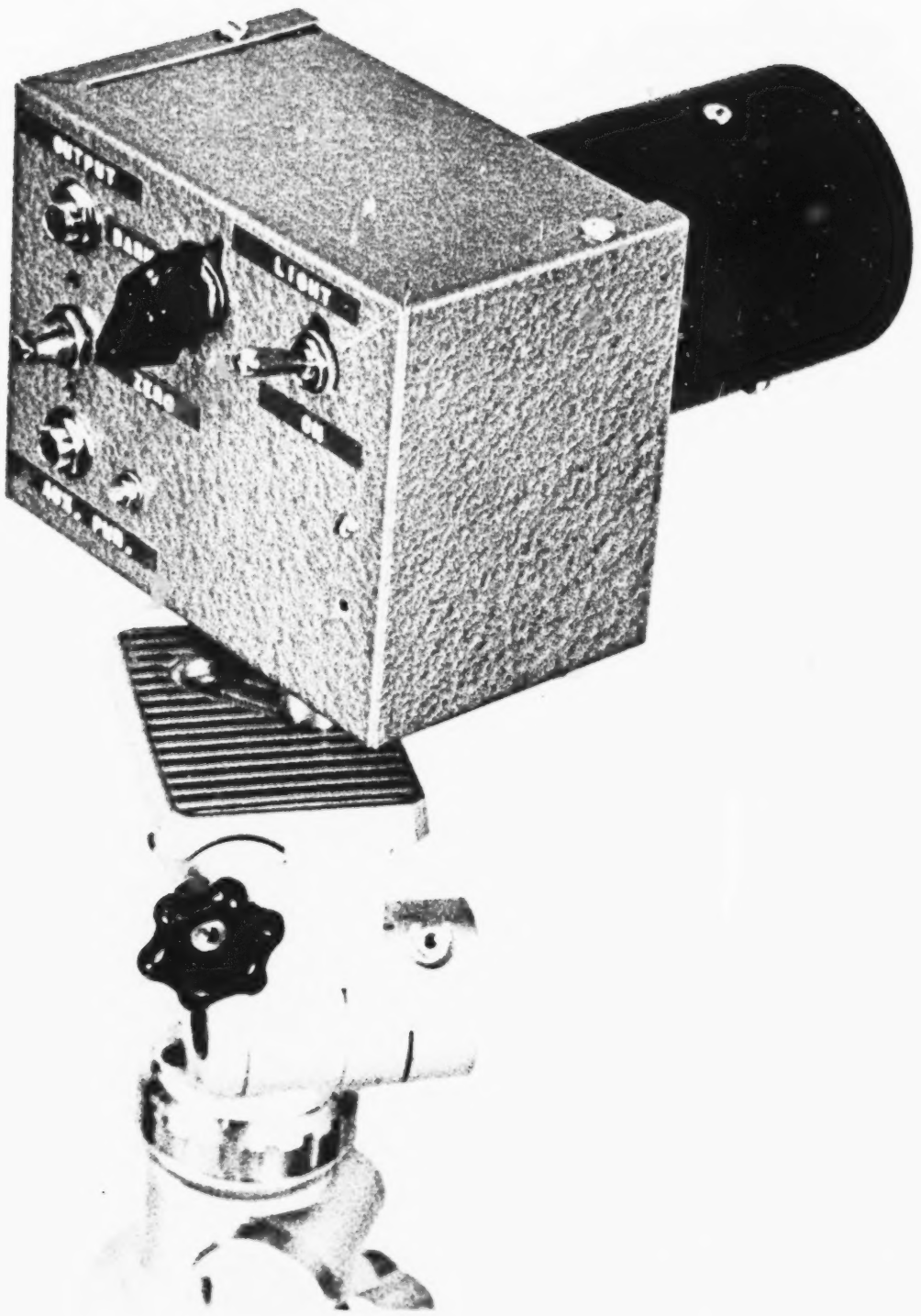


FIGURE 4. RANSCHBURG EFFECT (FIRST GRADE Ss)

APPENDIX C



ENCABULATOR SENSOR MODIFIED TO READ
REFLECTANCE IN 450 TO 700 MILLIMICRON RANGE

SIXTH INTERIM REPORT

PROJECT NO. 7-0646

GRANT NO. OEG-4-8-070646-0021-007

AMENDMENT NO. 2

AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION

Harold Burris-Meyer
Florida Ocean Sciences Institute, Inc.
604 Park Drive
University Park
Boca Raton, Florida 33432

December 1969

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TABLE OF CONTENTS

		Page
I.	INTRODUCTION AND SUMMARY	1
II.	OPERATIONS AND METHODS	1
III.	EQUIPMENT DEVELOPMENT	7
IV.	PROJECTED PROGRAM	9
V.	CONCLUSIONS	11

REFERENCES

APPENDIX A
Section from Minutes of Palm Beach County Board of Public Instruction Meeting October 1, 1969.

APPENDIX B
Sample of encabulator read-out tape.

APPENDIX C
Photographs

APPENDIX D
N-VC Devised Sample Lesson Plans Prepared for Lake Shore Elementary School, Belle Glade, Florida.

I. INTRODUCTION AND SUMMARY

During the sixth quarter laboratory and field testing continued. In the field, test programs were undertaken at the college level, in a migrant elementary school, and in a school for Seminole Indians in the Everglades. In the laboratory, testing focused on determining: (1) the degree of increased encabulator sensitivity, (2) the effects of ambient elements on test equipment, and (3) the collection of encabulator read-out tapes for comparison with field test data.

During the quarter modifications of the encabulator infrared detecting unit consisting of research, development, and procurement of a new optical system and amplifier were undertaken. These modifications are being incorporated into existing and future models. Laboratory tests indicate that amplifier modifications alone have increased sensitivity 1100 times with a corresponding increase in stability. Noise to signal ratio has been significantly decreased. Sub-contractor production delays held up delivery of Mark III encabulator. Delivery is expected by end of the period.

II. OPERATIONS AND METHODS

During the quarter use of the public schools of Palm Beach County for test purposes was sought and granted. Members of the County School Board voted unanimously to provide N-VC two schools as test sites. (Appendix A). This arrangement supplies the project with test populations throughout a range of socio-economic backgrounds. Only the restrictions of time and personnel limit working throughout the range. A number of sections of the County were considered before a decision was made to work in the Belle Glade area. Project staff members visited administrators and faculties of three schools in this area before selecting Lake Shore Elementary School as the immediate test site.

Rationale for this decision was that this school population is primarily migrant Negro, a group with which project personnel have had considerable experience over the past 18 months at the Markham Elementary School in Broward County. Experience at Markham with non-verbal, peer-produced, teaching techniques, as contrasted with commercial programs, has been found to be

Figure 1 has been deleted due to copyright restriction. The story, "Many County Schools Rate With Worst," by Tom Sawyer, appeared in the Palm Beach Post November 14, 1969.

(1). the lion sat in the chair and mouse in the. hole.

(2). he want the mouse.

(3). he want to eat the mouse.

(4). I think he will want to eat the mouse up. the mouse did some to him.

(1). the three bear pull the rope.

(2). day went up the hill to play.

(3). day went up the hill to pull the rope.

(4). day came home to eat supper with day mother give day some to eat. give them some neckbone and some bread and some soup and that was all day has. day went to bed to speelin. in the moning day eat breakfast it the table and day said moning mother and said Good morning children. When day Father came he said I have to go to work. day said by. and went to new york.

Figure 2

Need Achievement story written by
sixth grade student, Lake Shore Elementary School,
Belle Glade, Florida.

particularly successful with this kind of school population. (See Interim Report No. 2 and Appendix D Third Interim Report). N-VC will continue to utilize the Markham School for preparation of test materials, but use of all schools in Broward County for equipment testing purposes awaits approval by the County School Administration.

Finally, the need in the Belle Glade area in general and Lake Shore Elementary School in particular appeared to be the greatest. See Figures 1 and 2.

Consultation with area administrators led to the conclusion that research in the spelling curriculum would best suit our purpose for the following reasons. In the area of verbal learning spelling is one of the weakest skills for this population. In the classroom it is often taught with little forethought or imagination. It is one of the least researched subjects of the elementary school curriculum. Finally, its scope is relatively defined and can, therfore, be encompassed within project time and personnel limitations.

Accordingly the following design has been initiated at Lake Shore Elementary School in Belle Glade, Florida. Seven different classes are serving as experimental groups. These groups include one class from each grade level, 1-6, with two fifth grade groups. There are at least two control classes at the same grade level for each of the experimental grades. All control groups are instructed as outlined in the State adopted text book. All experimental group teachers receive detailed teaching instructions written by N-VC personnel. (Appendix D). The weekly instruction format is the same for each teacher, however, instructions within the basic format vary for each teacher on the basis of the grade level, spelling words for the week, past instruction, and skill achievement, etc. The format is as follows:

BACKGROUND FOR WEEK - In this section the teacher is informed as to the general approach for the week; i.e., Thanksgiving theme, poetry introduction.

DAY 1 - WORD PRESENTATION, PRONUNCIATION AND MEANING. TEACHER PREPARATION - This section appears for each instructional day and contains instructions for the teacher's preparation for that class period. This might include: projector at teacher's disposal for this period; arrangement of articles in the room so that students may "discover" the spelling words.

CLASS PROCEDURE

This section will vary to a great extent among the individual grades. The words for the week are presented by the teacher orally and/or visually, i.e., written on the chalk board, using picture or slides. The students, then, carefully pronounce the words. Additional reinforcement is obtained by having the students trace the words in the air or on the desk with their fingers; or write them on individual chalk-boards, etc. Meaning is obtained through student's using the words in sentences or stories; through creative dramatics (Woods, 1961; 1965); improvization; or drawing and labeling pictures.

DAY 2 - REVIEW AND ILLUSTRATION

This period is devoted primarily to creative writing and illustration of stories by the children. Each child has his own spelling folder in which he writes and illustrates his own story or sentences relating the spelling words to the theme of the week. At the end of the school year, each child will be the author and illustrator of his own series of short stories in book form. The best of these books can be laminated, bound and circulated through the school library, thus creating a core collection of books by and for a commercially neglected school population.

DAY 3 - PROOFREADING

During this period all illustrated stories from one class are exchanged with a class one grade level above for proofreading. This involves experimental groups throughout the school in a unified project in which the children are reading, circling errors, and learning important aspects of writing and criticism. This practice also provides a constant form of review and reinforcement.

DAY 4

All stories are returned to their proper "authors" for correction of errors found during the previous day's proofreading. The remainder of this day and DAY 5 is devoted to review, testing, creative dramatics, production of slides and tapes by outstanding "authors", creation of additional artwork, skill development, etc.

RATIONALE

The peer-produced approach to the teaching of spelling is unique to this project; however, peer-produced stories are not unique in themselves. This technique has met with great success at Markham Elementary School in conjunction with their language arts program (Berges, E.M., in press), and members of the Markham staff are acting as consultants for the present project. Student production of his own illustrated story, of necessity, directly involves the student in the learning process and is expected to result in enhanced student motivation with resultant improved learning. (Van Wagenen, 1963; Travers, 1964).

With the peer-produced approach all the arts are used to involve the student in the material to be learned. This total involvement heightens motivation and is expected to enhance learning.

The strong emphasis on proofreading in the N-VC approach is unique in that with all grade levels within the school participating in a unified proofreading effort a longitudinal spelling study is now under way. Bishop (1965) found with a limited sample, that proofreading as an integral part of a spelling program resulted not only in improved spelling by students but also significantly increased student interest.

QUANTITATIVE ANALYSES

The spelling program will be evaluated from the results obtained from two testing procedures.

1. Standard Achievement Test

Comparisons will be made of pre and post-research scores from the Stanford Achievement Test. (SAT). This standardized test is given both at the beginning and ending of the school year throughout the Palm Beach County School System. Mean class achievement for each grade level are being calculated from last year's SAT. A significant increase in achievement at the end of the present school year is expected as a result of the N-VC peer-produced spelling program. Results will not be available until the end of the 1970 school year.

2. Achievement Imagery

The second evaluative technique will be on the basis of Need Achievement scores (McClelland, 1953). Stories are

being obtained from both experimental and control students at each grade level, and these will be assessed for the amount of achievement motivation present. No significant difference is expected among experimental and control groups for tests administered at the beginning of the year. However, it is hypothesized that significant differences will appear between these groups in Need Achievement stories at the end of the school year. This predicted heightening of Need Achievement in the experimental groups follows from results of similar work now in the literature. (McClelland, 1953; Atkinson, 1948). Enhanced Need Achievement is expected in the experimental groups via the increased motivation and individual success implicit in the N-VC approach to teaching through the arts. (Zito and Bardon, 1969).

Relative to the spelling program, N-VC has been approached by a Florida Atlantic University College of Education based research project investigating reading problems of the Seminole Indians. Discussions to date have centered on mutual compatibility of research designs. N-VC views this project as an opportunity to replicate its spelling program with a third ethnic population.

Concurrent with the initiation of the spelling program, the following pilot study was undertaken at the College of Education, Florida Atlantic University. A basic assumption of the project, and a generally unresearched assumption in education, is that the more interesting the classroom presentation, the more learning-retention on the part of the student. There is a dearth of information in this area, particularly on the effects of different modes of audio narration. (Allen, Cooney and Weintraub, 1968). Related research suggests that audio style is a factor in learning. For example, Morton Wiener and his colleagues (cited by Mehrabian, 1968) found that faster learning occurred under conditions of positive intonation as compared with neutral intonation. (Mehrabian, 1968). On the other hand, the findings of Robert Silvey (1951) indicated that speaker's delivery of a broadcast did not significantly affect the listener's comprehension. On the basis of these findings N-VC undertook a study with two faculty members and their classes in the College of Education at Florida Atlantic University.

In this study written test results provide information for correlative analyses with Encabulator read-out, and provide quantifiable stimulus factors related to specific responses.

Two slide/tape productions were prepared pertaining to the paintings on display in two art galleries. The visual content (slides) was held constant between the two groups, as was the script that accompanied the slides. A stimulating vs. non-stimulating dichotomy was attempted through variation in

the verbal delivery of the script. The stimulating narration was performed by a well-known actor. The non-stimulating verbal delivery was relatively slower, with monotonous, repetitous phrasing. A 10 question multiple choice quiz based on the narrative content was prepared for learning-retention analyses. Each class served as its own control.

Testing was conducted over a period four weeks in the following sequence: Test I - week 1; Retest I - week 2; Test II - week 3; Retest II - week 4. Test and retest quizzes were identical for each audio-visual presentation. Analyses of the simultaneous encabulator monitoring related to emotional motivational differentiation are incomplete. The paradigm and results are shown in Table I.

TABLE 1.

Quiz results expressed as average percent correct. Retest scores are in parentheses.

	CLASS I			CLASS II		
Stimulating	Test 1	72%	(70%)	Test 2	75%	(76%)
Non-stimulating	Test 2	80%	(79%)	Test 1	71%	(77%)

The 1% difference in favor of the stimulating presentation found in Test 1 results (upper left and lower right corners of Table 1) is not impressive in support of the assumption that learning is potentiated by a more stimulating lecturer. The results from Test 2 however, (upper right and lower left corners of Table 1) favor enhanced learning under the non-stimulating condition. Although the validity of these results is questionable in that the groups were not matched for ability on Test 1, and the sequence of testing was implied to Ss on Test 2, the unexpected eight percent increase in correct responses by Class I for the non-stimulating presentation (compare upper and lower left corners) is believe to be of substantial value for guidance of on-going research into the possible causal influences of such factors as student expectation, sequential order, and temporal variables.

The operations in Belle Glade and Florida Atlantic University have been designed and undertaken to provide situations in which encabulator testing can take place as soon as the next instrument now under test is calibrated. The program at the College of Education of Florida Atlantic University can be run

in the classroom or on the controlled environment of the laboratory. In addition, the stimuli used in these programs may permit quantification.

The establishment of test programs such as these that can be evaluated by both paper and pencil tests and the encabulator is of considerable importance to the Project. Where correlative test results are found, credence is given to the new testing techniques of the encabulator and guidance is provided for the on-going program. Finally, encabulator testing provides constant and instantaneous response to the test pattern as opposed to the delayed response obtained from traditional paper and pencil test methods.

Though not yet statistically supported it has been stated by teachers in two test schools that discipline problems and truancy have almost disappeared in classes where N-VC teaching programs are in effect.

In response to a notice in Commerce Business Daily, N-VC responded to a National Institute of Mental Health quiry seeking organiztions interested in and capable of developing research projects to ascertain the effects of televised violence on the attitudes and behavior of children. After a discussion with the contracting officer we were advised to submit a detailed precis of the project. This was done on 12 September. Our approach in this matter was to suggest that N-VC would be using techniques and obtaining data that would be useful to researchers in this area, and that the project stands ready to exchange information and data.

III. EQUIPMENT DEVELOPMENT

The proposed test instrument modifications indicated in the last interim report have been initiated in an effort to increase the sensitivity of the infrared detector. These modifications include a new optics system with the design and construction of accompanying support and head assemblies, the development of a thin film thermistor bolometer by Airtronics, Inc., and new electronic circuitry.

The new optics system is of the Cassegrainian type (Hudson, 1969). The mirrors are made of pyrex with a vacuum evaporated aluminum coating and a 1/10th wave length SiO protective overcoating. A comparison of the old optical system to the new indicates that there are some advantages and disadvantages in the new system.

The main disadvantage of the new optics system is that it is a fairly slow system; i.e., with an f number of f/2, the image formed on the focal plane is very large in comparison to the detector size. For example, at 15 feet a man's head is .50" diameter on the focal plane, but the size of the thermistor is .006". However, the main reason for using a "slow" system is that the subject being studied can move in the lateral plane for several feet without his infrared image leaving the bolometer window. (Jamieson, McFee, Plass, Grube, Richards; 1963).

The following table provides technical comparison of the two systems.

TABLE 2

Technical comparison of the two N-VC reflector systems.

	Cassegrainian	Chrome Parabola
Active reflective area	37.73 sq.in.	12.52 sq. in.
Diameter	8 inches	8 inches
Reflective coating	Al. with SiO	Chrome
Reflectance at 9.6 microns	98.7%	60%
f/no.	f/2	f/.25
Size of image on focal plane	large	very small
Optical quality	.007" blur circle	.125" blur circle
Percent of incident radiation reflected to focal plane	98.7%	50% (loss of 10% due to optical imperfections)

As can be seen from the figures above, with a detector of a small surface area, the old chrome optical system with an f number of f/.25 is the most efficient of the two since it concentrates all of its collimated energy in a very small space. If a detector can be made with a surface area closer to the size of the subject's image in the Cassagrainian system (about .50" and 15'), it should be at least ten times more efficient than the chrome system.

However, since detectors generate electrical noise and since this noise is proportional to the square root of the detector area, some compromise has to be made. As yet, the most efficient detector size or best thermistor material has not been determined. From all studies made to date, and discussion with consultants these problems are not unique. (Hudson, 1969, p 185). We estimate that there is probably five or six months more work to be done on the detector design before we have what best fits our needs.

Progress toward improved detector design has been made by the development of a thin film thermistor by Airtronics, Inc. The thermistor has approximately 30 times the surface area of the present detector, and from preliminary experiments it appears to have a low noise level, thus lending itself well to the new optics system. Also, according to early test results, it is at least ten times more sensitive than the present infrared detector.

A new D.C. amplifier has been developed, and is presently bein tested for use in the encabulator. Preliminary test results are promising. The amplifier has a gain of 1100 times more than the existing amplifier and its drift rate and noise level are much lower. This amplifier will be used in the Mark III encabulator, and eventually all existing encabulators will be modified with this amplifier.

Present encabulator chairs continue to operate satisfactorily and are utilized in laboratory tests. Work on a chair with a telemetry system is in process (See Projected Program).

During the period the following persons or institutions provided engineering assistance and basic data from current research in the developing science of infrared optics: The Physics and/or Electronics Departments of the University of Miami, University of Florida, Florida State University, Ferson Optical Co., Infrared Division of Eastman Kodak Co., Perkins-Elmer Co., and Dr. George Cox of the U.S. Army Infrared Research Unit at Ft. Belvoir, Va.

IV. PROJECTED PROGRAM

Scheduled modifications of the Mark II encabulator are now being completed and being laboratory checked. The N-VC schedule for the next quarter calls for completion of laboratory testing and field testing. To determine its degree of increased sensitivity, a number of the research designs outlined in Appendix B

of the Fifth Interim Report are scheduled for replication. Receipt of Mark III is expected and once laboratory testing and calibration is completed it will be used in field testing.

A second encabulator seat telemetry system has been designed and is under construction. The system will free the seat from all direct electrical connections.

On the basis of information gained from pilot testing, the Test Program of the College of Education at Florida Atlantic University will be modified and expanded. It is expected that 15 classes will be available for testing during the winter quarter as opposed to two during the present quarter. Encabulator read-out will be obtained when possible.

The Belle Glade spelling program will continue. The College of Education at Florida Atlantic University has agreed to cooperate with N-VC by supplying a number of graduate and undergraduate students who will be assigned to preparing lesson plans for this projdct. In addition several students will work under the guidance of N-VC personnel in individual research problems related to non-verbal communication. One project, now in the initial design stage, will involve the relating of non-verbal response to color. The research paradigm will basically be an extension of color-form preference as discussed by Trabasso (1968) and the influence of the color-form preference on paired-associate verbal learning tasks in a task analogous to that used by Rosenberg, Langer and Stewart (1969). Stick figures will be used as stimuli with responses selected from: 1) congruent and noncongruent color words; and 2) congruent and non-congruent words selected from the activity scale of the semantic differential. (Heise, 1965).

Contact with personnel of the projected studies indicated in this section of the previous report is maintained. Collaborative testing can proceed with all of them at N-VC's discretion.

Thus, it is expected that by the end of the quarter encabulators of increased sensitivity will be in operation in local field test situations with data obtained from them being compared with data obtained from conventional paper and pencil tests. Contingent on local testing results, collaborative testing in other parts of the county will be undertaken. Though work in quantification of stimuli has been minimal, all test programs are preserved and as time permits can be submitted to quantification. The non-verbal response to color test design represents progress in this direction.

V. CONCLUSIONS

The following conclusions are summarized from the preceding sections:

1. Adequate sites are now available for on-going and immediately projected classroom studies.

2. Lesson plan forms are being progressively improved in terms of efficiency, simplicity, and built-in motivation.

3. Graduate students in education are participating in presentation planning and program testing.

4. Increased sensitivity in test equipment is being achieved. Research for even greater sensitivity continues.

5. Informal reports from teachers and principals attest the enthusiasm of students participating in N-VC class programs, resulting in improved learning rate, consistent attendance and significantly improved classroom behavior.

REFERENCES

Listing in detail of all references in body of text.

Allen, W. H., Cooney, S.M., and Weintraub, R. Audio Implementation of still and motion pictures. Project Report No. 5-0741 U.S. Department of Health, Education, and Welfare, Office of Education, 1968.

Atkinson, J.W., and McClelland. The projective expression of needs: II. The effect of different intensities of the hunger drive on thematic apperception. J. exp. Psychol., 1948, 38, 643-658

Berges, E.M., Peer-produced Books in the Markham Summer 1969 Program, in press.

Bishop, I.E., The comparison of a conventional method of teaching spelling with a method emphasizing proofreading as an integral part of spelling program. Disser. Absts., 1965

Heise, D. R., Semantic differential profiles for 1,000 most frequent English words. Psychol. Monographs, 1965, 79 (Whole No. 601), 1-30.

Hudson, Richard D., Infrared System Engineering, New York: Wiley, 1969, p. 171-234.

Jamieson, J. A., McFee, R.H., Plass, G.N., Grube, R.H., Richards, R.G., Infrared Physics and Engineering, New York: McGraw-Hill, 1963. 123-289.

McClelland, D.C., Atkinson, J.W., Clark, R.A., and Lowell, E.L., The Achievement Motive. New York: Appleton-Century-Crofts, 1953.

Mehrabian, A. Communication without words. Psychol. Today, 1968, 2, 52-55

Rosenberg, B.G., Langer, J. and Stewart, J. Non-verbal learning. Am. J. Psychol., 1969, 82, 181-190.

REFERENCES

Silvey, R., The intelligibility of broadcast talks. Public Opinion Quart., 1951, 15, 299-304.

Trabasso, T., Pay attention. Psych. Today, 1968, 2, 30-36.

Travers, R.M.W., Van Wagenan, R.K., Haygood, D.H., and McCormick, M. Learning as a consequence of the learner's task involvement under different conditions of feedback. J. Ed., Psychol., 1964, 55, 167-173.

Van Wagenan, R.K., and Travers, R.M.W. Learning under conditions of direct and vicarious reinforcement. J.Ed. Psychol., 1963, 54, 356-362

Woods, Margaret S., The Sevens, Eights and Nines Create Dramatically, Creative Dramatics, Association for Childhood Education International, Washington, D.C., 1961.

Woods, Margaret S., Success in Spelling, Resources for Teaching and Learning, April, 1965.

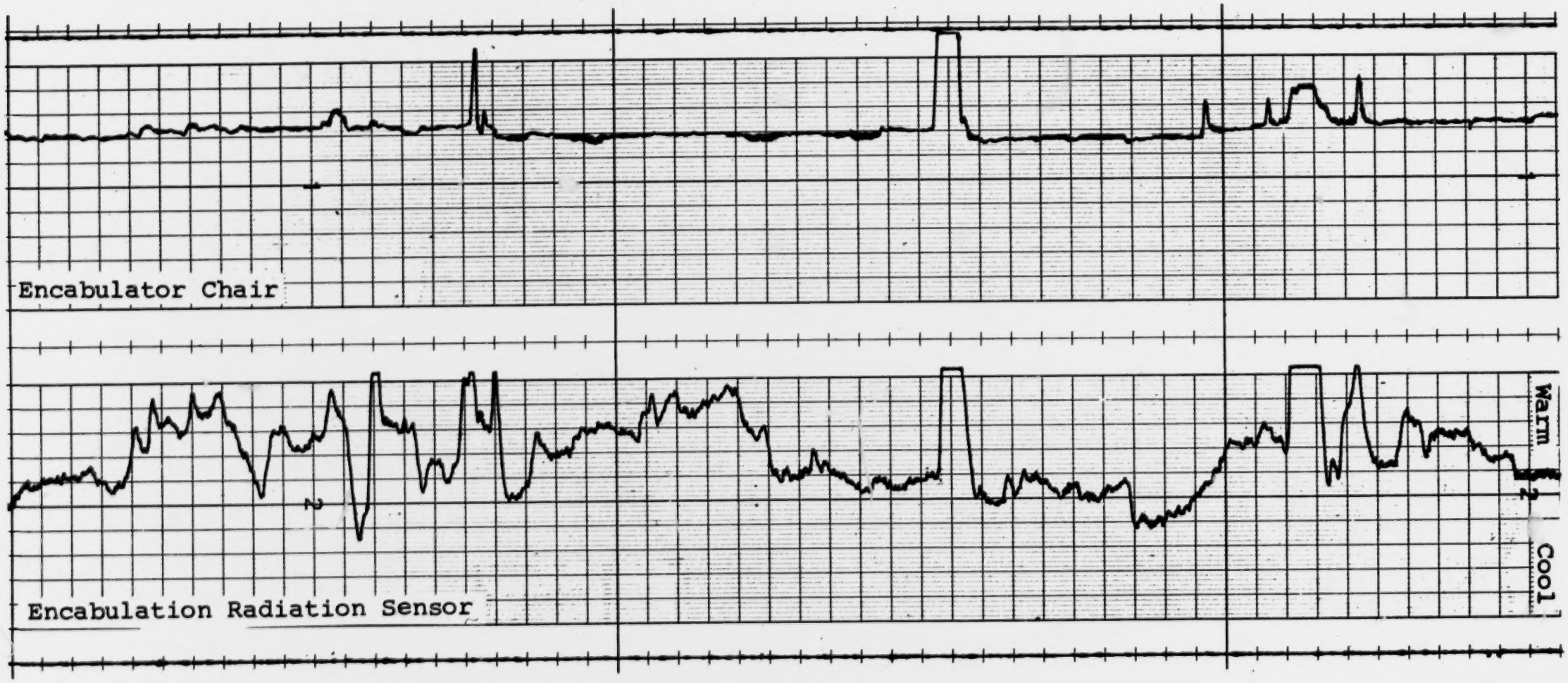
Zito, R. J., and Bardon, J. I. Achievement motivation among negro adolescents in regular and special education programs. Am. J. Ment. Def., 74, 1, 1969.

APPENDIX A

Minutes of a Palm Beach County School Board Meeting October 1, 1969.

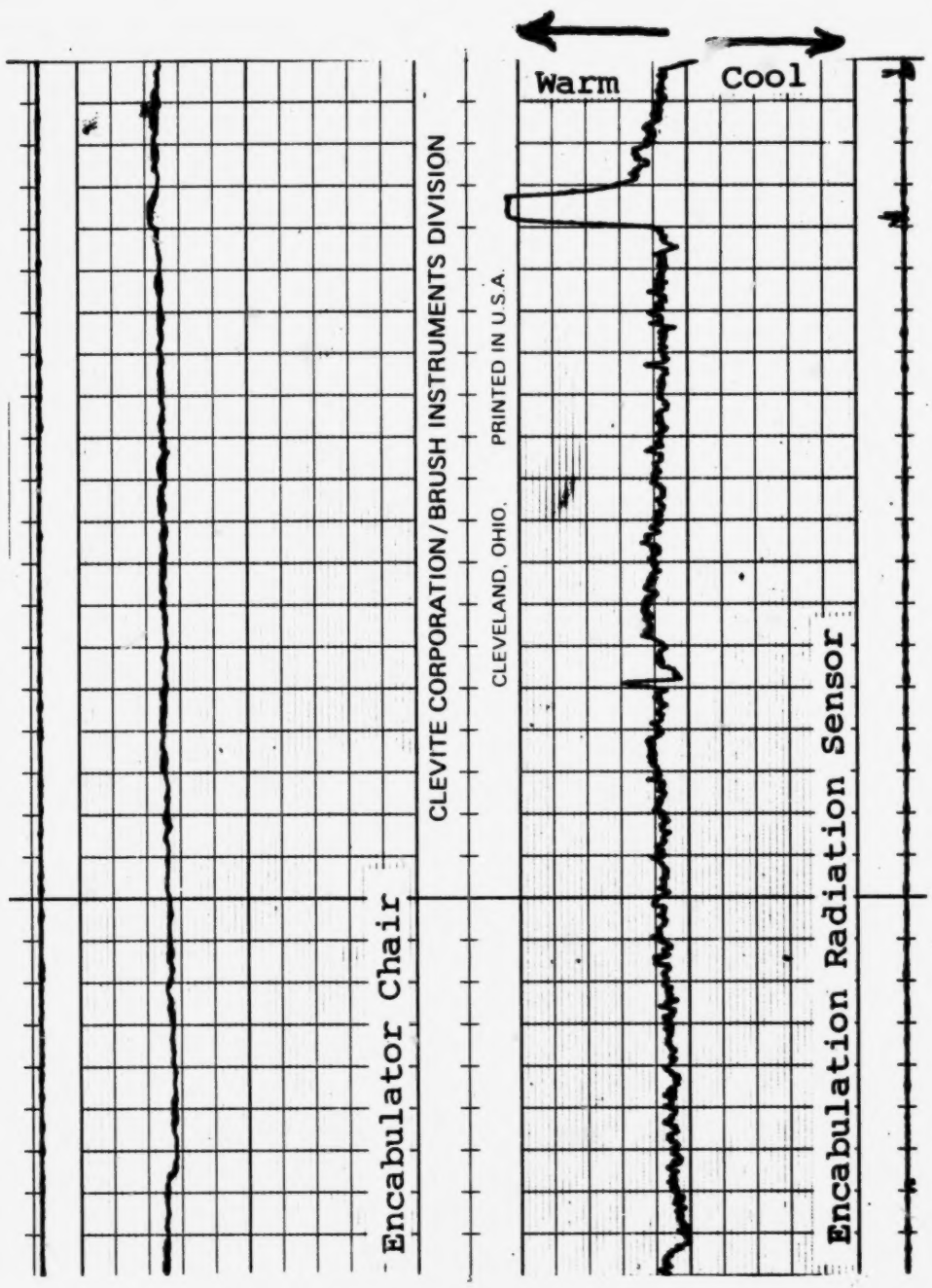
Permission Granted for Use of Two Elementary Schools and Faculties Under U.S.O.E. Research Bureau Grant: This research proposal would involve the students and faculties of two elementary schools. The educational research will be conducted by persons funded under a U.S.O.E. Research Bureau Grant and the salaries of the staff, as well as the equipment to be used, will be paid by the U.S.O.E. also.

Upon the recommendation of the Superintendent and ON MOTION OF WYMER-MCKAY, THE BOARD UNANIMOUSLY GRANTED PERMISSION FOR THE USE OF TWO ELEMENTARY SCHOOLS AND THEIR FACULTIES UNDER U.S.O.E. RESEARCH BUREAU GRANT.



APPENDIX B

Figure 3



APPENDIX B

Figure 4

Figures 3 and 4 represent continuous segments of the same encabulator read-out tape taken from the same subject. Figure 3 represents a male college student's response to a selection of soul-rock music by Janis Joplin. Figure 4 represents response to quiet theme music from "Midnight Cowboy" movie.

Figures 5 and 6 (pictures) were removed due to non-reproducibility.

APPENDIX D

LAKE SHORE ELEMENTARY SCHOOL

SPELLING LESSON PLAN

TEACHER ALL TEACHERS WEEK December 15-19

LESSON # 7 GRADE 1 through 6

WORDS FOR THE WEEK: These words have been chosen from the song, THE TWELVE DAYS OF CHRISTMAS. Use as many of the words as you believe your class can manage. You may wish to add your own words to the list on the basis of what gifts your class uses.

one	first	seven	seventh	partridge	leaping
two	second	eight	eighth	pear	swimming
three	third	nine	ninth	ladies	dancing
four	fourth	ten	tenth	turtle	
five	fifth	eleven	eleventh	ring	
six	sixth	twelve	twelfth		

BACKGROUND FOR WEEK

This week, as last week, will be directed toward the Christmas holiday period. All grade levels will be using the same basic approach. The spelling words for the week will be taken from the Christmas song, The Twelve Days of Christmas, and the focus will be primarily on the learning of the words "one" through "twelve" and "first" through "twelfth".

THE TWELVE DAYS OF CHRISTMAS

The twelve days of Christmas lie between December 25 and Epiphany, January 6. It was on January 6 that the Three Magi brought gifts to the Christ Child in the manger - the first Christmas gifts! It was a common folk belief that on the eve of January 6 animals were given the power of speech.

DAY 3. Proofreading will be omitted this week.

If you use all of the numbers suggested, at some time during the week you should point out the changes in endings for the numbers one - first; two - second; three - third; and twelve - twelfth.

APPENDIX D

Teacher _____

DAY 1 - MONDAY

TEACHER PREPARATION

Since the words for the week will be some of those contained in the song, The Twelve Days of Christmas, we thought it might be more motivating if the children learned to sing the song. At least, it might be stimulating for the children to see slides of the song and hear the song sung by one of the classes at your school. Therefore, sometime during this first day we will come to your room and show the music and slide production to your class. The time will be that decided upon by you last Thursday.

CLASS PROCEDURE

1. The audio visual presentation of The Twelve Days of Christmas will be shown to your class.

2. Following the presentation, you should be prepared to give the background of the song to your class (the explanation of the song is on page one of your spelling plans for this week under THE TWELVE DAYS OF CHRISTMAS). Three items from the explanation should be explained to the children: 1) Three Magi (the three wisemen); 2) common folk belief (what the people believed to be true); 3) eve (the evening before, as in Christmas Eve).

3. After the children understand that this song tells about giving presents for 12 days during the Christmas period, ask them how many gifts were given and number from one to twelve after they tell you, on the board. Then see if they can remember what the gifts were for each day and put the names of the gifts on the board following the appropriate number. As each gift is listed (have the children spell the name as you put it down if possible, or at least give you the beginning letter), you should discuss the meaning of the gift. The following are suggested as explanations for gifts that may not be known to the children.

A. partridge - any of a number of North American domestic birds (domestic in this case means living in a certain area). It is chicken-like in looks, but a little fatter. It is considered very fine food by many people.

APPENDIX D

DAY 1 - MONDAY
CLASS PROCEDURE (cont.)

B. turtle doves - (turtledove is presented as one word in the dictionary, not as two); a particular type of pigeon with a long tail.

C. French hens - we were unable to find a definition of French hen that we could be certain of, nor were the librarians at the local library able to find the definition. We believe that it is a domestic type hen that was developed by breeding in France, and considered a good bird for eating. This should be given as a possible explanation but the children should know that this may or may not be the true meaning.

D. calling birds - this is the interesting one. In some books, the fourth day gifts were "calling birds", but in other books, they are "colly birds". Colly means to blacken as with coal dust or soot; hence, a colly bird was a black bird.

APPENDIX D

Teacher _____

DAY 2 - TUESDAY

TEACHER PREPARATION

You should have the overhead projector and the acetate copy of The Twelve Days of Christmas.

*Some of the classes will have ditto sheets to pass out to the students on which to fill in the blanks with the spelling words.

CLASS PROCEDURE

1. Ask the children what song they heard yesterday and put the name on the board. Have them spell any words they can before you write them.

2. Again, put the numbers 1-12 on the board. Have the students then give you the spelling of each of the numbers (if possible), and write these next to the appropriate numbers. You will next get a third column - the adjectives for each of the numbers; i.e.,

1 - one - first
2 - two - second
etc.
12 - twelve - twelfth

Leave these on the board (with enough space left at the end of each to put the name of a gift.

3. Project the words to the song on the screen (or whatever), and have some of the students go up and point out certain words and spell them such as first, partridge, etc.

4. Have the class read through one verse and then try to sing it. If possible, have the children sing the entire song.

5. Go back to the 1 - one - first, etc. that you have written on the board. Explain to the children that the song they just sang was written many, many years ago. Ask such questions as, "Did those seem like strange gifts?". "Would you expect to get the same gifts today?" Suggest that they might like to write their own version of the song with gifts that they would like to receive or give over the 12 days. As they give you their versions of the gifts, write them next to the appropriate

DAY 2 - TUESDAY
CLASS PROCEDURE (cont.)

numbers, i.e.

1 - one - first - a coconut in a palm tree

You may wish to have the class sing each verse as they go along, to see if the words fit easily with the music (i.e., a partridge in a pear tree; a coconut in a palm tree). If time, you may have them begin to copy down the numbers and gifts on the board. The copying can be completed tomorrow (remember no proofreading exchange of folders this week).

*THOS WHO HAVE DITTO SHEETS, PASS THEM OUT TO THE CHILDREN TO BE COMPLETED. Verses may be cut and pasted to other sheets of paper for illustrating certain verses.

APPENDIX D

Teacher _____

DAY 3 - WEDNESDAY

TEACHER PREPARATION

Have the copy of the song and the overhead projector ready. Also have crayons for illustrating. You will need the projector only if you wish to have the children try to sing the song again today, or spell some of the words that you cover in the song, etc.

CLASS PROCEDURE

1. Go through the procedure of getting 1 - one - first, etc. on the board (with the children spelling as you go along), also write the gifts they suggested. The students should complete the copying of these.

2. Let the students illustrate on other sheets of paper. At this point, the number of illustrations should be determined by what you believe the ability of your class to be. In the lower grades or with some of the less capable students, you may wish to assign two or three of the 12 days to each row of students, or to certain groups. Of course, the advanced students should be encouraged to write and illustrate their own special gifts and not rely upon what the class has chosen.

NOTE: Do not worry about not having enough time to copy and illustrate. You may wish to have the children do only the copying today and save the illustrating for tomorrow. This procedure is expected to cover a two day period.

APPENDIX D

Teacher _____

DAY 4 - THURSDAY

TEACHER PREPARATION

Crayons for illustrating should be available.

CLASS PROCEDURE

The students should proofread what they copied yesterday from the board. Then they should either begin, or continue, the illustrating.

If some of the students should complete their illustrating before the end of the period, encourage them in other activities such as helping other students with proofreading, or writing other verses with different gifts.

APPENDIX D

Teacher _____

DAY 5 - FRIDAY

TEACHER PREPARATION

Have index cards available, either blank for the children to write their own gifts on or already with gifts written on them. The approach you select from those below will determine whether you write on the cards first. IN ANY CASE, ALL 12 CARDS SHOULD HAVE A NUMBER TO CORRESPOND WITH THE 12 DAYS OF CHRISTMAS.

You may wish to have the projector ready to go over the song before beginning the lesson.

CLASS PROCEDURE

The basic approach is: 1) hand out one index card with a number on it to each of 12 students, 2) these students will stand or go to the front of the class and sing the gift written on his card. The entire class should sing all the parts of the song except the name of the gift, and this will be sung by the student holding the appropriate card. For instance,

CLASS On the first day of Christmas my true love sent to me

STUDENT WITH INDEX CARD #1 A coconut on a palm tree

The above suggested approach may be changed in the following ways depending upon the ability of your class.

a. have 12 children write new gifts on the cards and hand these to 12 other students to be sung.

b. have 12 students write the gifts that they have been using during the week in writing the group version of the song.

c. the teacher writes the gifts on the index cards and gives them to 12 students.

d. the teacher writes the gifts on acetate and projects them on the board for the class to read and sing.

e. the teacher has a child fill in (spell) on the acetate parts of the song for the rest of the class to sing; i.e. On the _____day of Christmas, etc.

FIFTH INTERIM REPORT

PROJECT NO. 7-0646

GRANT NO. OEG-4-8-070646-0021-007

AMENDMENT NO. 2

AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION

Harold Burris-Meyer
Florida Ocean Sciences Institute, Inc.
604 Park Drive
University Park
Boca Raton, Florida 33432

September 1969

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TABLE OF CONTENTS

		Page
1.	Introduction and Summary	1
2.	Operations and Methods	1
3.	Equipment Development	3
4.	Projected Program	3
5.	Conclusions	4
6.	Appendix A - Personnel	5
	Appendix B - Laboratory Tests 1,2,3,4 and Photographs	7

I. INTRODUCTION AND SUMMARY

Activity during the fifth quarter has concentrated on field and laboratory tests designed to specifically associate instrumental read-out with known and controlled stimuli. Stimuli consisted of (1) a commercial television program, (2) a series of musical selections presented in an order estimated to induce a progressive change in emotional response and, (3) a dichotomous series of pictures. Additionally, laboratory experiments were undertaken to ascertain sensitivity of test equipment. Each experiment to date has indicated that further instrumental sensitivity is desirable. Studies to date likewise suggest the need for the analysis of the physiologic basis of the responses under study.

II. OPERATIONS AND METHODS

Initial field tests, concluded in December 1968, suggest the probable validity of the proposition that the emotional involvement of a student in class could be detected and measured indirectly through radiation and body movement. Read-out at this time was preserved for analysis by recording vacuum tube voltmeter signals on video tape. This method of recording was considered to be more cumbersome, expensive, and less accurate than would be generally desirable. The test apparatus was then taken to a laboratory established in N-VC offices and a dual track penmotor read-out system established.

In April a series of subjects were tested using a recorded audio program. Results of these laboratory tests appeared to be sufficiently definitive to justify a second series of field tests which were undertaken during the period May 23-29 in association with the Program Analysis Department of the Columbia Broadcasting System in New York.

CBS test procedure consisted in outlining the purpose of the test to an audience, averaging 22 people, gathered in a special room in the CBS Building. They were told that the program they were about to see was the first 26 minute episode of a situation comedy being considered for broadcast next season. The 16 mm film was projected through a normal color television receiver. Light, temperature and sound level were constant during and between presentations. Each seat was equipped with two colored push buttons: A green one to be pressed if the subject liked the presentation, and a red one if he did not like it. The button pushing was recorded on a chart recorder. A Questionnaire

was filled out by the subject at the conclusion of the presentation and an informal discussion between the subjects and the person conducting the test followed. Though subjects were aware of the fact that they were a test audience, they were not conscious of the presence of the two encabulator radiation sensors which were set-up in the front corners of the test room. During a week's run, 17 subjects were tested, all of them by the radiation sensors; 11 were measured with the strain gauge sensor built into a chair.

Analyses of the results were then undertaken at the laboratory in Boca Raton. The read-out tapes from the button pushing were brought into register with the encabulator read-out tapes and both sets were compared with coded identification of the significant elements of the presentation taken from the scenario and noted on the tapes at the time of presentation.

Visual analysis of the CBS data indicated differential magnitude of response in the case of many subjects at predictable points, but could not be considered statistically significant on two grounds. First, the small size of the sample; second, the fact that measurement was unprecise: i.e. the sensitivity of the encabulator radiation sensor was insufficient to provide the desired amplitude variation for definitive interpretation and the noise to signal ratio was high. However, these disadvantages aside, the encabulator provided information all the time, the button pushing provided information only 9% of the time, for N-VC staff observed that when the audience appeared involved, no buttons were pushed. Also no buttons were pushed when the audience seemed bored. So these two highly significant phenomena were not discernible in the records made by the Columbia apparatus. Additionally no significant correlation was found between an individual subject's button pushing, the questionnaire, and the verbal discussion to indicate clearly his response to the program.

As a result of the CBS field test it was decided that in order to identify and measure precisely the correlation between emotional stimuli and resultant vasomotor activity, or movement responses, a large number of subjects would have to be tested with an identical program under carefully controlled conditions. Therefore, the encabulator was set up in the laboratory and a series of tests were undertaken using first, auditory and later, visual stimuli. Results are set forth in Appendix B.

Concurrently a search of the literature relative to emotion and body change is in process. The result of this search to date has indicated that investigation of skin temperature variations on specific parts of the body under emotional stimulation has not been exhaustive. The problem is of considerable importance to encabulator calibration and to N-VC laboratory experiments outlined in Appendix B. Also a parallel literature search relative to physiological response to music has revealed a considerable body of data on variation in pulse, blood pressure and GSR, but little on skin temperature. We are now in correspondence with medical researchers concerned with this problem.

During the period of this report the psychologist billet was filled. See Appendix A.

III. EQUIPMENT DEVELOPMENT

As has been indicated, laboratory tests have suggested progressive modifications and indicated the need for greater sensitivity in the radiation sensor. Accordingly, Mark II.1 and Mark II.2 have been modified and Mark III will not be delivered until after the test of a new optics system and installation of thin-film thermistors. In both, Mark II and III, the original signal will be greatly amplified and electronic noise substantially reduced. The improved models should be available in September.

A Polygraph has been lent to the Project for the purpose ascertaining the extent, if any, to which Polygraph and encabulator read-outs can be associated or reconciled. Preliminary experiments have been undertaken (see Appendix B) under the guidance of the lending organization's polygraph experts.

IV. PROJECTED PROGRAM

The N-VC schedule for the next three months calls for the modifications of the Mark II encabulators, delivery of Mark III and calibration in the laboratory. A series of field tests will then be undertaken in nearby experimental, and conventional schools in a disadvantaged area. Also, a number of studies are projected to be undertaken at Temple University, in connection with the diagnostic program in the Skin and Cancer Hospital; at Mt. Sinai

Hospital in connection with the Sleep Program; and at General Motors, in connection with driver hazard, advertising, and styling programs; and again at CBS. Arrangements and read-out equipment modifications are being made to study test data with the aid of a computer in the laboratories of Goodfriend-Ostergaard Associates, Cedar Knolls, New Jersey. Mr. Goodfriend is a consultant to N-VC.

V. CONCLUSIONS

The following conclusions are summarized from the preceding sections: (1) Greater sensitivity in test equipment is necessary and is expected to be achieved through improved lens systems and thin film thermistors. (2) Improved test equipment must continue to be laboratory tested and calibrated against precise and controlled stimuli and (3) Results found in the laboratory applied to practical field testing in educational, medical and commercial programs. (4) Continued search of the literature, correspondence, and conferences with authorities will continue to serve as a guide to program planning, equipment testing, and analyses of results.

APPENDIX A

PERSONNEL

Dr. Ginger Hamilton
260 N.E. Wave Crest Way
Boca Raton, Florida

B.S., Ohio University; M.A. and Ph.D., The Ohio State University; U.S.P.H. Fellow during graduate training; N.S.F. summer fellowship for training in modern mathematics; instructor of mathematics at San Jose State College for Peace Corps Trainees; teacher in Green Township, Ohio and Tampa, Florida; Head of Science and Mathematics Department, Kohala High School, Kohala, Hawaii; instructor of teachers in modern mathematics at Fremont, California; member of Phi Kappa Phi and Psi Chi; while at Fremont, California, performed statistical analyses to evaluate various methods of science instruction; statistical analyses of physiological classical-conditioning data while at The Ohio State University.

Publications include "Incentive Contrast Effects on Primate Discrimination Performance" (manuscript in preparation); "Effects of Addition and Subtraction of Stimulus Cues on Discrimination Performance in Monkeys" (manuscript in preparation: major findings presently in press in the chapter on attention theory and discrimination learning by J.M. Warren and Brendan McGonigle to appear in N.S. Sutherland and R.W. Gilbert (Eds.) Discrimination Learning (London: Academic Press); "An Investigation of the Visual-learning Deficit Associates with Inferotemporatl Isocortical Resections in Monkeys; Ph.D. dissertation; research is being extended and therefore results will not be ready for publication until 1970.

N-VC Responsibility: Research Psychologist: experimental design and analyses.

APPENDIX A

Personnel

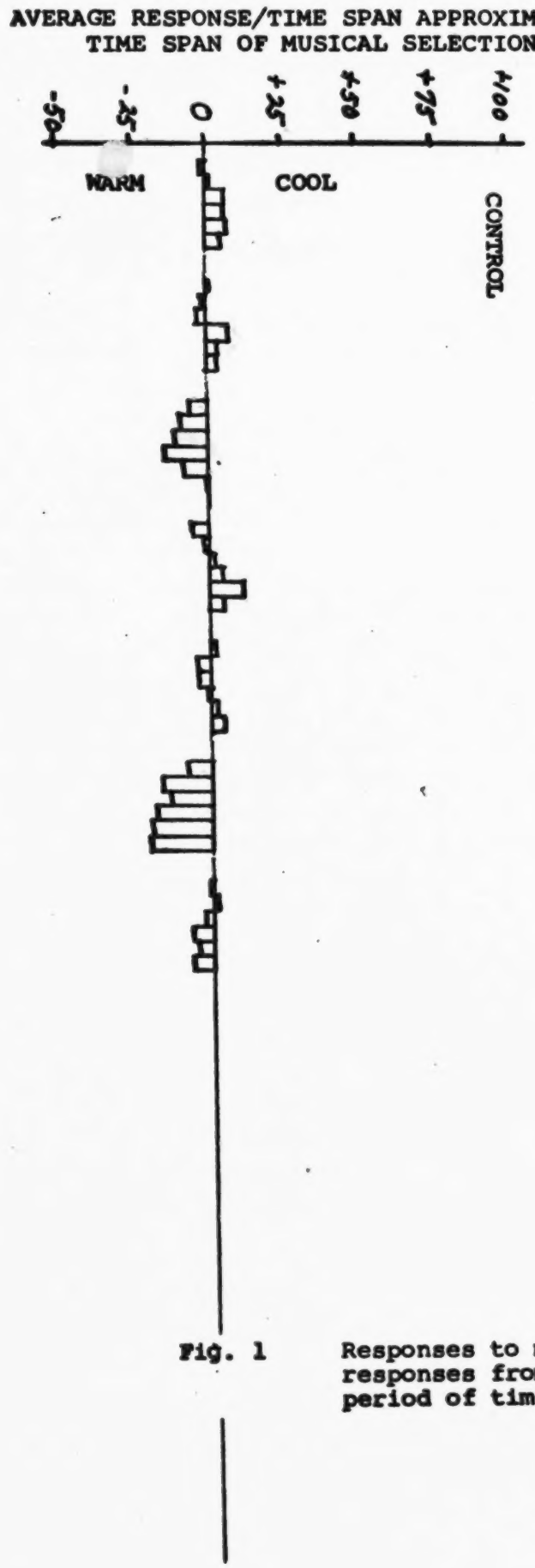
John J. Shearer
2602 N.E. 5th Avenue
Boca Raton, Florida

BS Florida State University; has taught electronics in Senior High Schools and adult education courses in Duval and Broward Counties, Florida; President of AVCON Systems, Inc., Tallahassee, Florida

N-VC Responsibility: Design and Engineering.

Dr. Harold Abramson
133 E. 58th Street
New York, New York
In American Men of Science, and
Who's Who In America

N-VC Responsibility: Consultant in the field of psychiatry.



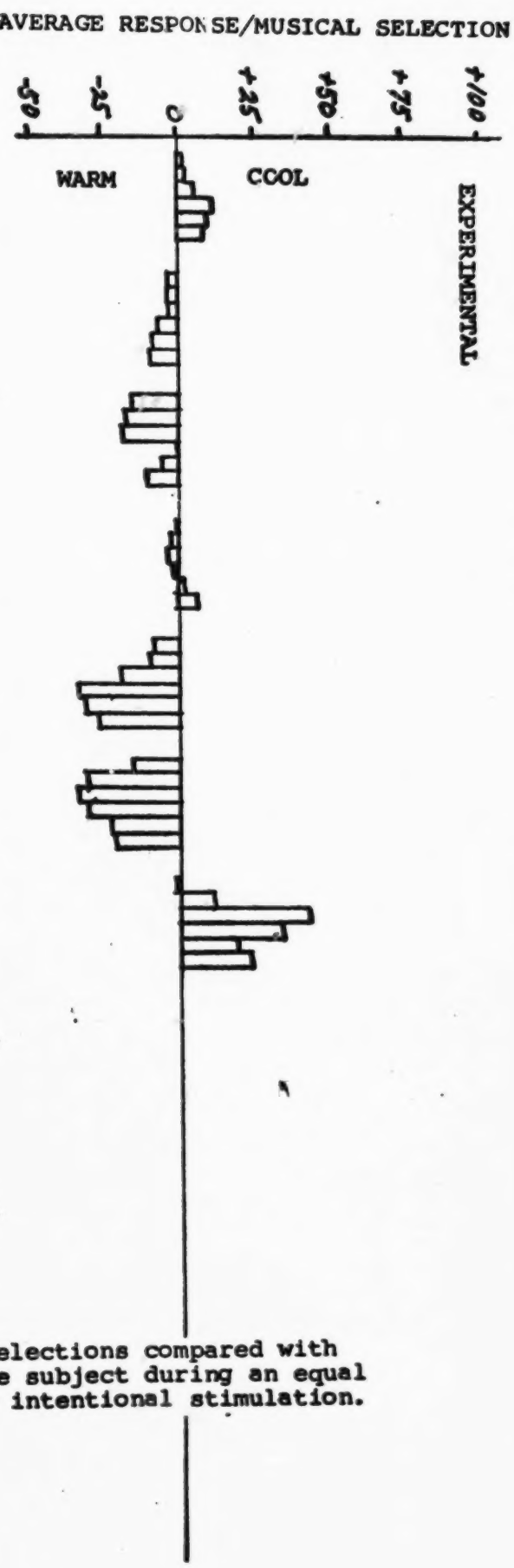


Fig. 1 Responses to musical selections compared with responses from the same subject during an equal period of time with no intentional stimulation.

APPENDIX B

Results of field testing at CBS late in the last quarter indicated the need for a series of tests to precisely relate controlled stimuli to encabulator read-out. Implied in this decision was the need for controlled environmental conditions for testing. It was concluded that such control could be best achieved in the N-VC laboratory and the following series of tests were undertaken:

EXPERIMENT 1.

A 25 minute music tape was prepared composed of six three to five minute selections of "classical" music arranged on a continuum intended to elicit responses from a mood of excitement to reverie. Subjects exposed to this program were also subjected to control periods of equal interval in which the experimental conditions were constant in all respects except that a white noise tape was played in place of music. All control testing was counterbalanced as to the day preceding or following the day of experimental testing. The purpose of the control was to establish a base line for the subjects with which to compare their response to musical stimuli. All subjects were tested by the encabulator radiation sensing unit and either the strain gauge chair or polygraph. Results are represented in Figure 1. The tracings, one experimental and one control, which follow Figure 1 are representative examples of these chart recorder tracings which were taken during encabulations.

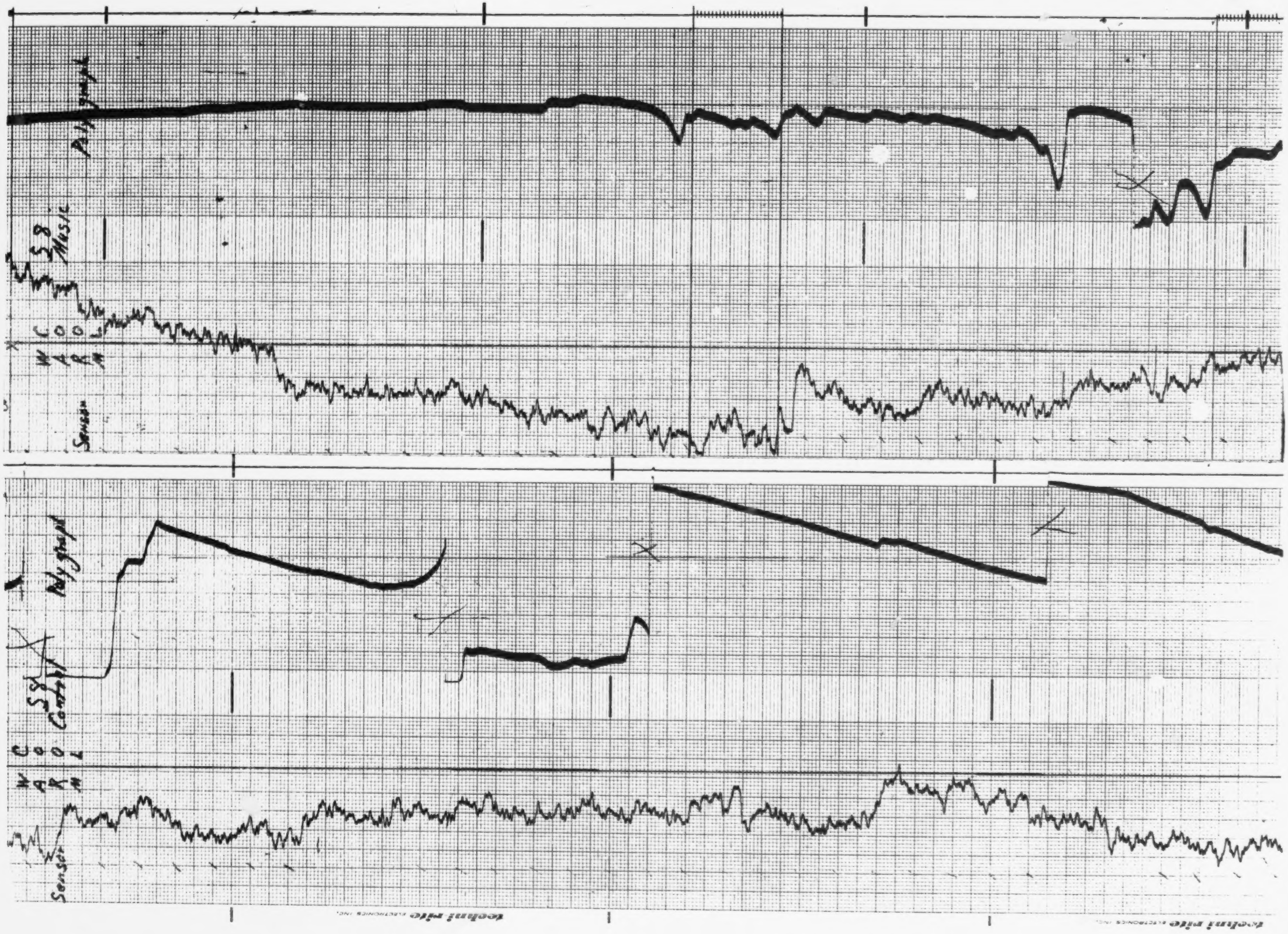
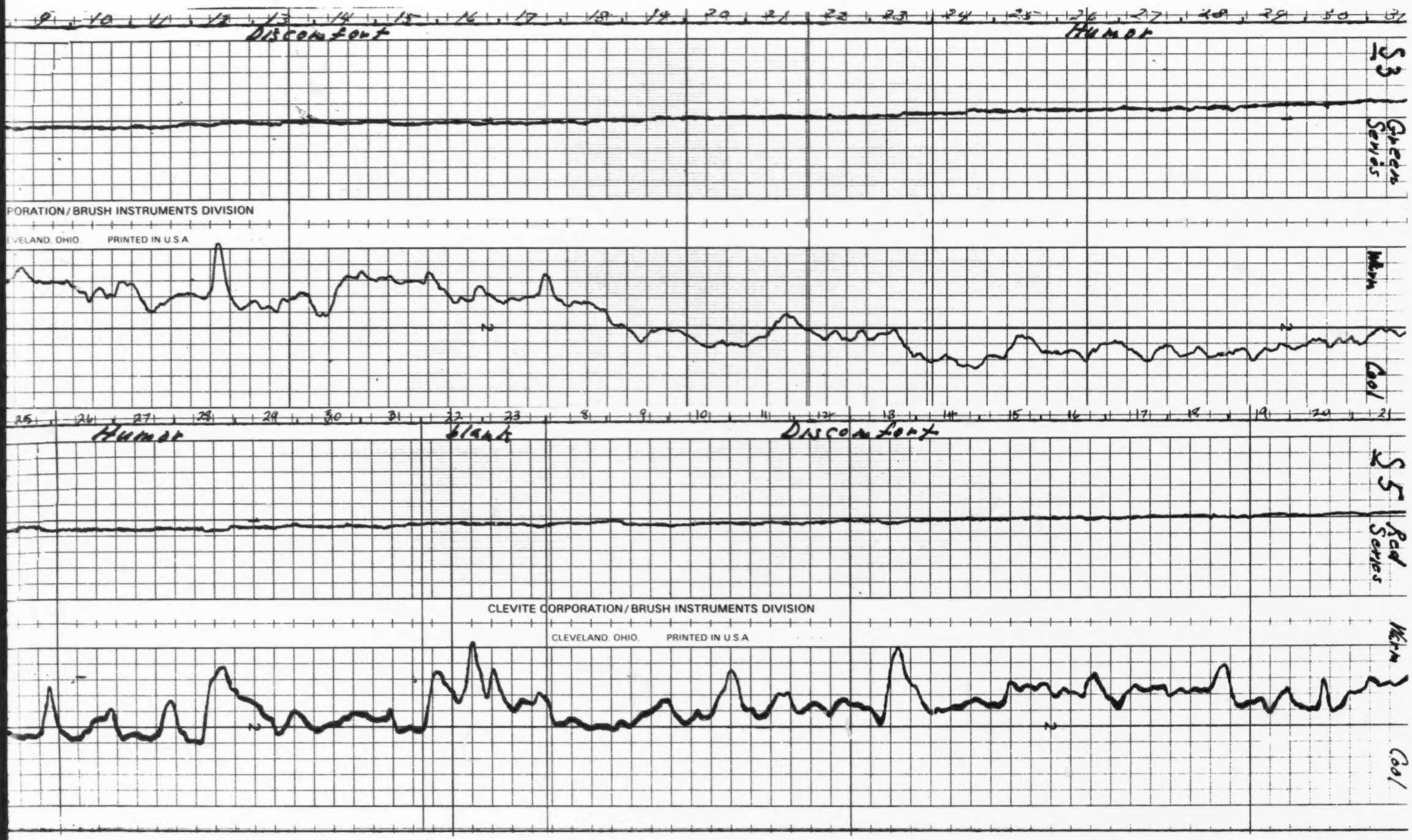

Polygraph
GSR
Music
COOL
WARM
Sensor
Polygraph
GSR
Control
COOL
WARM
Sensor
Recording Rate ELECTRONICS INC.
Recording Rate ELECTRONICS INC.

Fig. 2 Responses to individual slides. Green series: 14 discomforting pictures followed by 8 humorous pictures. Red series: 8 humorous pictures followed by 14 discomforting pictures.


Discomfort
Humor
S3
Green Series
Warm
Cool
CLEVITE CORPORATION/BRUSH INSTRUMENTS DIVISION
CLEVELAND, OHIO PRINTED IN U.S.A.
Humor
Blank
Discomfort
S5
Red Series
Warm
Cool
CLEVITE CORPORATION/BRUSH INSTRUMENTS DIVISION
CLEVELAND, OHIO. PRINTED IN U.S.A.

EXPERIMENT 2.

Concurrent with testing during Experiment 1, a visual presentation was prepared. A series of 31 slides prepared from book and magazine photographs was arranged into 2 categories: (1) those intended to elicit a humorous response and (2) those intended to elicit unpleasant feelings. Again, environmental conditions (i.e., ambient temperature, subject acclimation to existing temperature; humidity; noise and illumination levels) were held constant. All instructions were on slides, thereby reducing experimenter bias, and white noise was played throughout each period of testing. All subjects were encabulated and, in addition, spoke their verbal reactions to the slides into a tape recorder for later comparison with encabulator read-out.

The results from 8 subjects are graphically depicted in Figure 2. Representative encabulator readings follow Figure 2. "Red" and "green" series refer to reversal of the between-subject order of the dichotomy. The trend in the results from either series was toward relatively greater "warmth" response during the slide series intended to elicit unpleasant feelings. Statistical significance and validity of this trend must await proposed mechanical improvements.

EXPERIMENT 3.

The variable results from the "control" sessions of Experiment 1 indicated that non-instructed reference sessions for each subject were not satisfactory. A series of slides were therefore made with the intention of providing, neither a dichotomy nor a continuum, but a maintained stimulus input throughout a specified time interval. Each of these slides contained a three-digit number selected from a table of random numbers. As soon as each slide appeared, the subject counted backward from that number until the next slide appeared. Continuation of this experiment awaits the radiation sensor improvements.

EXPERIMENT 4.

The results of experiments 1, 2 and 3 indicated the need for several changes in the radiation sensor device. A number of the problems have been identified and are in the process of being corrected by the design and construction of a new infrared optics system of the Cassegrainian type. Calculations indicate that the system should increase the sensitivity by a factor of 500 or better.

Because of the expected increase in sensitivity as a direct result of the new optics system, we are now conducting experiments with the existing sensor head to determine what effect the new system will have on its thermal stability.

By using a black body and controlling all pertinent vairables, (such as ambient temperature, thermal drafts, movement, distance from target to sensor, etc.) these experiments will determine the thermal dissipation rate of the sensor head, and enable temperature callibration of the encabulator so that an exact infrared emissivity profile of the human body may be determined.

Preliminary investigations indicate that there will have to be additional changes of the thermal circuit in the sensor head, but at this time it is too early to determine exactly what these changes may be.

CONCLUSIONS

From these fundamental experiments the following conclusions have been made: (1) It is expected that stability and sensitivity will be increased with improved reflectors and thermistors; (2) stimuli presently in use may be too subtle for present developmental stage of equipment and techniques; therefore, music tapes, slides and movies with higher emotion provoking potential are being sought and prepared; (3) a cursory analysis of both the literature and visual comparison between polygraph and encabulator read-out indicates that a high correlation between the two is unlikely; however, this does not rule out the very real possibility of the encabulator as a reinforcement and supplement to polygraph techniques; (4) the data collected from the body-movement unit of the encabulator continues to be useful as a check on the radiation unit, and at this time, appears to afford the necessary sensitivity; therefore, future efforts to improve equipment sensitivity are primarily directed toward the radiation unit.

Finally, the literature and our preliminary studies indicate the lack of, and need for experimentation relating responses of the cutaneous vasuclar bed to emotional stimuli. In addition the need for information concerning the level and type of stimulus required to elicit specific and general vascular responses is clearly indicated.

APPENDIX C

The Photographs have been removed due to their non-reproducibility.

PHOTOGRAPHS

PROGRAM ANALYSIS ROOM AT C.B.S. WITH N-VC ENCABULATOR IN CORNER.

PREPARATION OF C.B.S. READ-OUT TAPES FOR ANALYSES.

N-VC TEST STUDIO IN BOCA RATON.

READ-OUT ROOM AT C.B.S.

FOURTH INTERIM REPORT

PROJECT NO. 7-0646

GRANT NO. OEG-4-8-070646-0021-007

AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION

Harold Burris-Meyer
Florida Ocean Sciences Institute, Inc.
604 Park Drive
University Park
Boca Raton, Florida 33432

April 1969

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TABLE OF CONTENTS

		Page
I.	Summary of the Year's Activity	1
II.	Current Operations	2
III.	Projected Program	2
IV.	Projections	3
V.	Appendix	5

In-house Test Report

N-VC Laboratory Equipment Lay-out

Photographs of Encabulator in Position for Calibration

Typical Read-out Tapes Showing Subject Response to Standard Stimuli.

I. SUMMARY OF THE YEAR'S ACTIVITY

HEW Grant 7-0646 contract year ended 28 February 1969. The operating time was extended by letter 10 April 1969 to such time as appropriated funds should be exhausted. This date has been established as 31 May 1969. The contract covering the next fiscal period is to take effect 1 June 1969. In summary the following things have been accomplished from the inception of the project to date.

A staff has been assembled consisting of 5 full-time and 3 part-time members and 13 consultants. Operations have proceeded under the guidance of consultants who have met periodically to review and evaluate operations, plan and project detailed programs for the ensuing operating periods, and individually have undertaken numerous supporting tasks.

Engineering studies for the test apparatus (encabulator) were initiated and are being carried on by Airtronics, Inc., of Herndon, Virginia. Mark II-1 has been twice modified to achieve increased sensitivity and stability and portability. Mark II-2 is under test. It responds to a target area much greater than Mark II-1. Mark III is under construction. It will have the highest sensitivity possible at this time. Mark IV, using a cadmium teluride lens as a collector and filter has been designed. It will be built when detailed specifications are determined from Mark III tests in one or more ancillary projects.

A series of field tests in three schools have been completed. Five peer-produced slide/tape lesson presentations were prepared and employed in these field tests. The test program established that a measurable relationship exists between stimulus and emotional response. A laboratory study was then undertaken to calibrate instruments, develop a working scale of affective intensity and standardize a read-out form.

The laboratory facility established in N-VC offices consists of a test chamber containing projectors for audio and visual stimuli, and chair and radiation sensor units of the encabulator. Control of audio and visual presentations and encabulator read-out are in an adjoining room. (Appendix)

A bibliographic study has adduced significant information relating to test program development. A procedure has been set up to make available pertinent studies undertaken under government contracts.

II. CURRENT OPERATIONS

A program to relate specific controlled stimuli to individual response has been underway for more than a month. Penmotor read-out (see Appendix) shows similarity of reaction by many subjects.

A test series consisting of auditory stimuli in musical form and codified according to the Cardinell scale is being assembled.

A series of tests to validate pupil acceptance of peer-produced multisensory techniques is being designed for the Markham School where most students are disadvantaged children of agricultural migrants.

III. PROJECTED PROGRAM

STAFF: Dr. Brunson has been assigned to N-VC for another year by the Broward County Board of Public Instruction. He will continue to serve as Chief Educational Psychologist.

A staff Research Psychologist will be employed to conduct the experimental programs.

IN-HOUSE EXPERIMENTAL PROGRAM: In-house operations will consist of:

1. Designing and producing test presentations containing measurable stimuli.

2. Subjecting these to encabulator read-out and employing test results in further refinement of presentations.

3. Additional programs designed to measure subjects' induced, emotional involvement will be conducted in cooperation with Palm Beach County Instructional Television and the previously mentioned Markham Elementary School.

4. The effect on a subject of the consciousness that he is a subject will be studied by simultaneous measurement by the encabulator and a polygraph which has been made available by Airtronics at no cost to the Project.

ANCILLARY PROJECTS: Agreements have been reached with

. General Motors Corporation, Columbia Broadcasting System, Los Angeles County Sheriff's Department. These organizations will establish research programs using the encabulator to identify and record emotional involvement resulting from controlled stimuli. The Los Angeles studies will involve the simultaneous use of the encabulator and polygraph. Columbia Broadcasting System will employ the encabulator in conjunction with its battery of pre-test techniques for evaluating audience acceptance of programs and commercials. N-VC is to undertake contracts to modify equipment and develop test procedures suited to specific problems.which may arise in any of the ancillary projects. All data will be transmitted to N-VC for comparison with other material contributing to the basic objective of the project. Under study but not yet committed, are cooperative projects with the F.A.A., NSF and NASA. All cooperative programs will be conducted under N-VC supervision without cost to the Project.

All organizations planning to participate in ancillary projects are treating the planned cooperative studies as in-house confidential.

IV. PROJECTIONS

It is estimated that by the end of the second fiscal period guidelines can be established from test data to provide formulae for the preparation of educational presentations.

It is further anticipated that enough will be known about visual stimuli to undertake a study of relative effectiveness of visual and auditory stimuli and of conditions under which they may reinforce, counterpoint, or cancel one another.

It is estimated that ancillary program testing will be in process in a number of locations, supplying data for detailed and precise analysis by computer techniques now under investigation.

It is estimated that N-VC will, by the end of the second fiscal period, be in a position to teach educators to apply instrumentally pre-tested presentation techniques and to subject teaching programs to continuous immediate test and improvement.

APPENDIX

IN-HOUSE TEST PROGRAM #1

OBJECTIVES

1. To discover the amplitude of response to a specific auditory stimulus.
2. To isolate and identify the types of response of different individuals as recorded by the encabulator.
3. To associate the stimulus with the response.

APPARATUS

The test presentation was an audio tape especially made for this experiment, reproduced over a system capable of 20 to 20,000 H_z response.

Measurements of subjects was by the encabulator Mark II-1 installed in the test room as shown in the diagram and photographs. Read-out was recorded on a H-P 322 chart recorder.

Sound levels were measured with a G-R 1555A Sound Survey Meter.

EXPERIMENTAL PATTERN

The subject was aware of the fact that he was being studied, but details of the mechanism were not disclosed, so that he would not be tempted to influence the results consciously.

The subject was seated in the encabulator chair with the radiation sensor, ten feet distant, focused on his face.

The presentation consisted of a series of instructions spoken to the subjects in which the subjects were directed to assume successively those attitudes normal to persons watching an audio/visual presentation. The instructions

were followed by a short musical selection from Richard Strauss' THUS SPOKE ZARATHUSTRA. The sound level involved two peaks at 83 db. The episode lasted seven minutes.

Temperature and illumination were noted for all tests and were stable throughout each test.

Tests were made over a period of three weeks. Twenty-five Florida Atlantic University students were used as subjects.

RESULTS

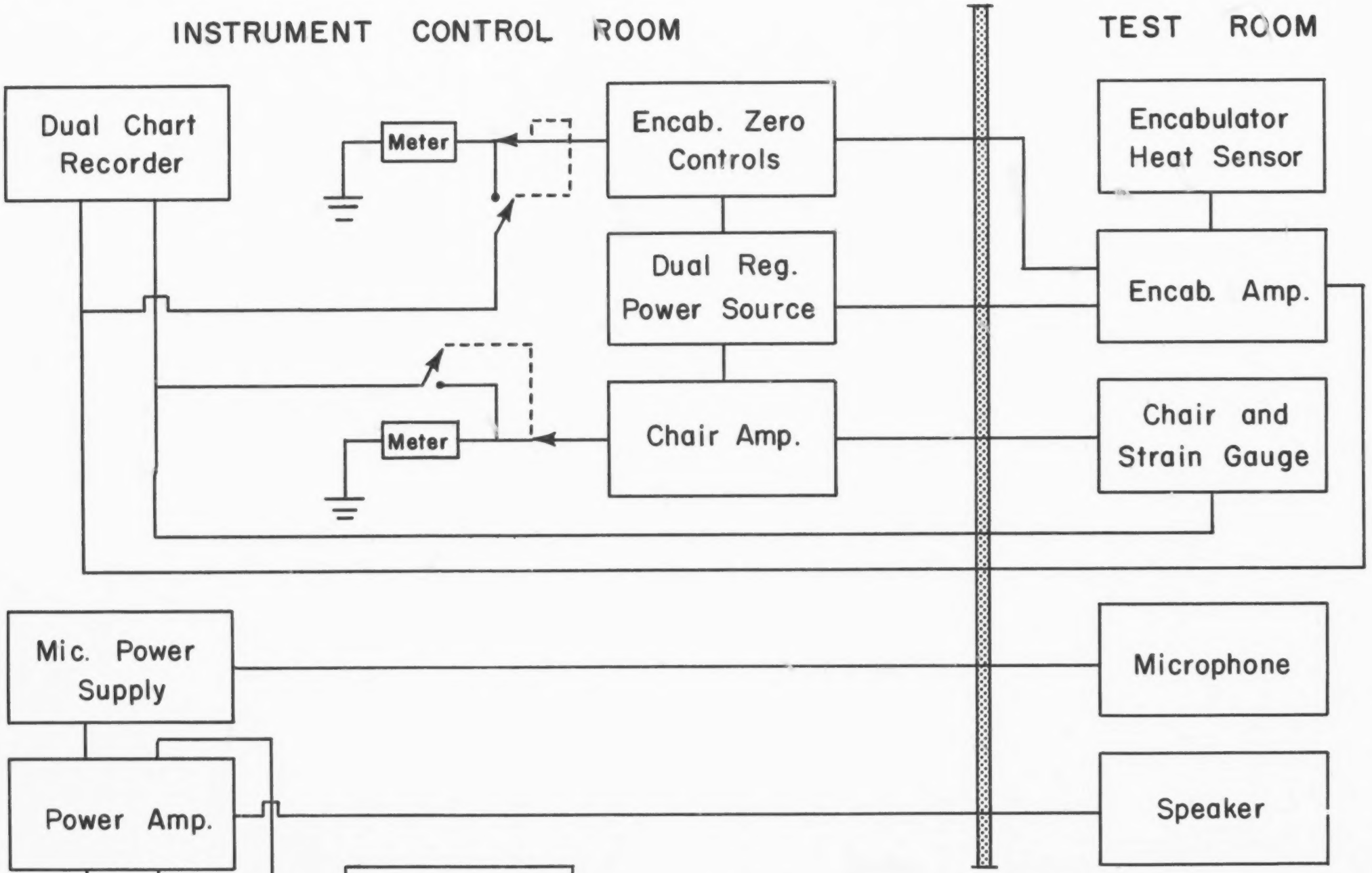
Typical read-out tapes and interpretations are appended. Responses varied no more than shown in these tapes.

COMMENT

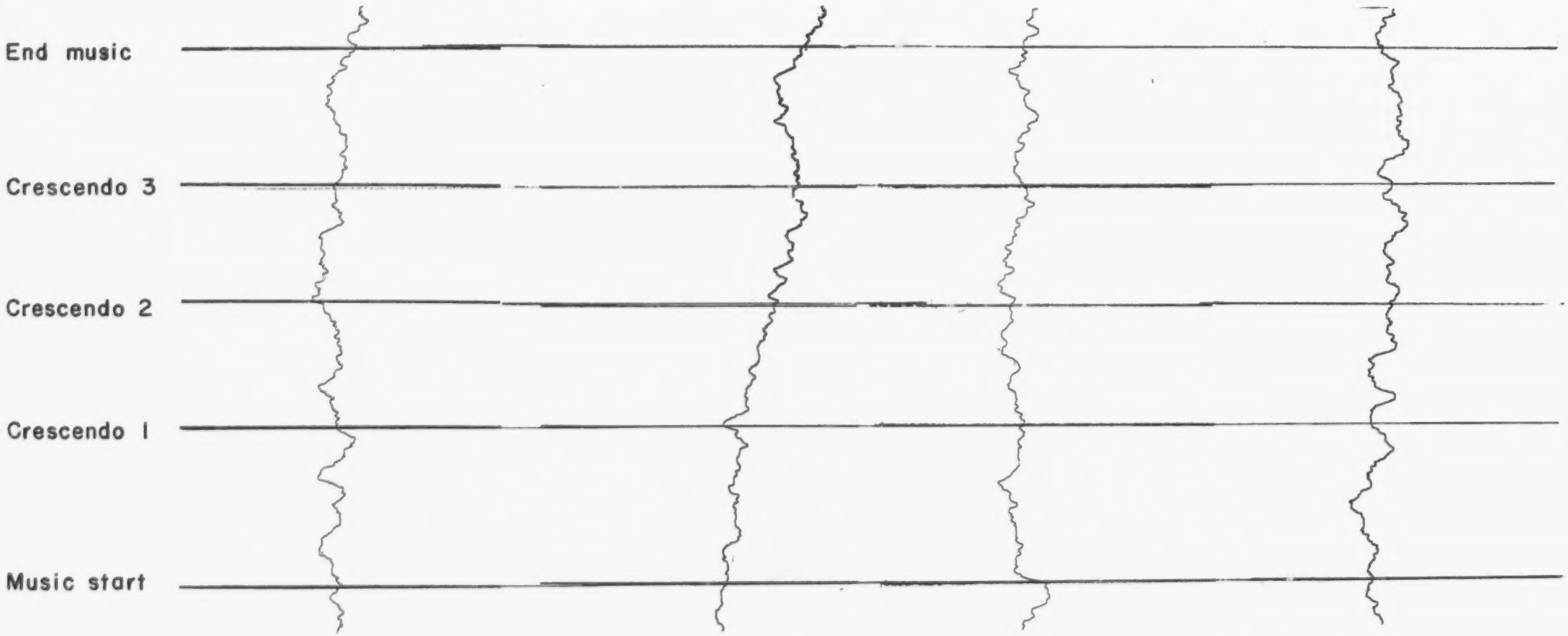
With respect to the first objective, it is observed that amplitude of response is measurable. However, stimuli did not approach the limits of sensitivity of the subject in frequency or intensity. They did not include spectra previously shown to induce emotional stress. They involved no visual accompaniment. Considerable further experiment is necessary to establish limits of response, and to form the basis of a scale.

Subjects produced similar traces in response to standard stimuli. Traces appear to have complex characteristics whose significance cannot be adequately studied by purely visual methods. With an adequate sample, analysis of trace slope, and time as well as amplitude appears to require computer study. However, traces so far produced are sufficiently revealing to be adequate for comparative test of teaching materials and techniques in the classroom, and for showing relative degrees of emotional involvement in response to many types of audio and visual stimuli.

With respect to the third objective, it appears that the traces are now interpretable at least to the extent necessary to associate them with the elements of the stimuli currently measured. Mathematical analysis should be possible when a large number of samples is in hand.



N-V C LABORATORY EQUIPMENT LAYOUT

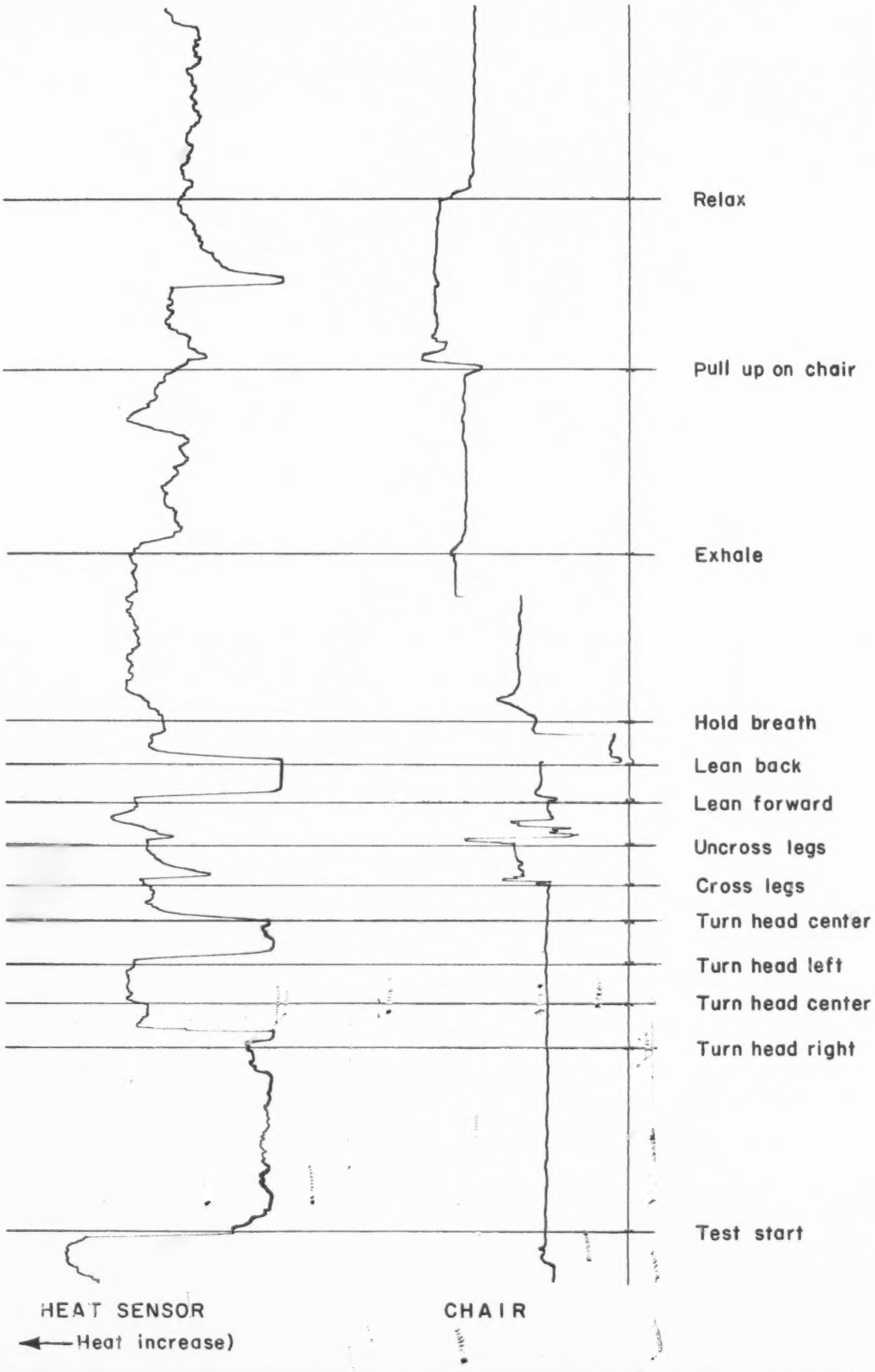


MARK II-I ENCABULATOR HEAT SENSOR TRACINGS FROM 4 SUBJECTS.

MUSIC SEGMENT FROM TEST PROGRAM I. (HEAT INCREASE ⟶)

Changes of Direction of Traces Shows Vasomotor Change Associated With Specific Points in the Musical Presentation

MARK II-1 ENCABULATOR TRACING FROM TEST PROGRAM 1 AFTER INCREASE IN SENSITIVITY



THIRD INTERIM REPORT

PROJECT NO. 7-0646

GRANT NO. OEG-4-8-070646-0021-007

AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION

Harold Burris-Meyer
Florida Atlantic Ocean Sciences Institute, Inc.
604 Park Drive
University Park
Boca Raton, Florida 33432

January 1969

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TABLE OF CONTENTS

	Page
Precis	1
The Report	2
Appendix A - Personnel	10
Appendix B - Comment on Operations	18
Appendix C - Photographs	23
Appendix D - Peer Produced Multi-Sensory Techniques	30
Appendix E - Financial Statement	32

PRECIS

The Non-Verbal Communication (N-VC) Project is as of this date ahead of the schedule in instrumentation. Winnowing of bibliographic material continues. Test program development has stayed ahead of apparatus calibration and testing.

Operations undertaken during the period September 15 to December 15 involved three series of field tests of the encabulator at Delray Beach Elementary School, Palm Beach Junior College and Jupiter High School. The consultants observed the last test at Jupiter.

Several experimental presentations prepared according to concepts set forth by N-VC psychologist, Dr. F. Ward Brunson (See Appendix D) were instrumentally tested and subjected to parallel evaluation by conventional pedagogical methods including questionnaires and class discussions.

As of this date the effectiveness of the instrumentation has been established and a program of refinement has been undertaken. Although the only public disclosure of the program has been the paper delivered at the 6th International Congress on Acoustics (Appendix D, First Quarterly Report) inquiries concerning the application of N-VC instrumentation and techniques to industrial and governmental problems have been forthcoming (See Ancillary Projects, page 8).

BIBLIOGRAPHY

During this quarter relevant bibliographic material has been catalogued onto 3 x 5 cards referenced by both subject and author. In addition, professional bibliographer, Mr. George Counts, has been employed (see Appendix A) and currently is compiling a list of periodicals and bibliographies to be screened for material relevant to N-VC test procedures and productions. Material judged important to N-VC is abstracted onto 3 x 5 cards, as above, reviewed by N-VC personnel, and material deemed significant is read by staff members. The bibliographic study will have principal importance in the development of next year's experimental patterns in which it is essential to exploit in detail all pertinent accumulated knowledge.

OPERATIONS

Pursuant to the program set forth on page 4, Second Quarterly Report, the principal activity of the quarter has been directed toward bringing the apparatus and technique and its use to a point where it can be duplicated for use in multiple tests. This report is basically a chronological statement of work accomplished.

TEST PROGRAMS

The apparatus (encabulator, see Appendix C - photo 1) consists of two parts. One is a radiation sensor which reads skin radiation as it varies with vasomotor changes induced by emotion. The second instrument is a chair equipped with gauges which measure the physical attitude and muscular tension of the occupant. The form of read-out can depend upon the type of information required, in some cases a computer to reduce the many variables to a single expression, or a penmotor to give a written record. In the tests here described, read-out has been on simple vacuum tube voltmeters (VTVM), which serve the first requirement of identifying the response and indicating degree.

The first purpose of the instruments developed for this project is to measure response of people en masse, in normal, rather than in laboratory environments. It was, therefore, necessary to see if significant data could be obtained under actual conditions of use. This requirement could be satisfied in part, even though only one test chair was used, and the radiation sensor beam set to encompass only a single individual. All phenomena which might affect the test results such

as temperature and light variations incident to change of time of day, movement of subjects, etc., would thus be encountered and if significant, could be circumvented in design improvement. It is recognized that multiplication of chair sensors and altered radiation sensor focus will be necessary before statistically significant data can be expected. The initial tests in use could therefore demonstrate only a reliable relationship between stimulus and response, and indicate technical requirements to guide instrument modification and development as might be required.

The schoolroom appeared to be the place best fulfilling the requirements for encabulator test in use. Four presentations employing peer produced multi-sensory techniques developed by Dr. Brunson were prepared. They provide excellent test material because they contrast so widely with conventional classroom presentations. The degree of emotional involvement of the students is measurable by standard as well as electronic means. Also, by virtue of their flexible construction, elements of the presentations can be altered and re-tested as a means to identifying and measuring individual stimuli.

The presentations were slide/tape lessons in which students planned the lesson scenario, indicated or actually took the pictures and narrated the lesson in their own words onto audio tape as the pictures were projected. Presentations were WELCOME TO MARKHAM, a beginner's orientation lesson, WALT WHITMAN, VISIT TO AN ART GALLERY, THE CITRUS FAMILY and VOCABULARY BUILDING. A peer produced program on drug abuse for presentation to High School audiences is being developed under Dr. Brunson's direction and will be ready for test in January.

ENCABULATOR FIELD TEST NO. 1

In September the radiation detector of the encabulator was brought to Boca Raton and on 10 October field tested in a 6th grade class at Delray Beach Elementary School. The tests employed the radiation unit only. Read-out was on a vacuum tube voltmeter on a 1 to 10 scale. In one episode THE BATTLE HYMN OF THE REPUBLIC was used as a part of one presentation. The so-called goose flesh reaction on the final crescendo is a familiar phenomenon, arising from the contraction of the capillaries. At this instant, the radiation read-out showed a consistent drop with a clean undistorted signal. In another situation an embarrassed subject raised the read-out 1.5 above the 5 normal, indicating vasodilation with increased radiation. These tests showed that the radiation element of the

encabulator was responding in a quantifiable manner to skin radiation changes. Additional sensitivity and greater stability appeared desirable. The radiation sensor was therefore returned to Airtronics for modification. During the period of tests Mr. Harchak, of Airtronics, instructed Mr. Althouse of the N-VC staff (see Appendix A) in the operation and maintenance of the apparatus.

CONSULTANTS MEETING 20 OCTOBER 1968 AT DETROIT

At the consultants meeting 20 October in Detroit the following were present: Dr. F. Ward Brunson, Harold Burris-Meyer, Richmond L. Cardinell, Dr. Theodore W. Forbes, Lewis S. Goodfriend, Dr. Robert Herman, Charles Vicinus. The presentations used for apparatus test were shown to the consultants and test results discussed. The state of the project was reviewed, and the next quarter's program and responsibilities of individuals were decided.

Dr. Brunson and Mr. Goodfriend argued that non-parametric statistical analysis of encabulator read-out data best filled the requirements of the project. Mr. Goodfriend recommended the portable P D P 8 digital computer as ideally suited to the study of data in the form presented. Such instrumentation may become a requirement of the project in the near future.

Mr. Cardinell agreed to assemble a group of musical compositions which had been classified for employment as functional background music, for use with slide/tape presentations. These will provide controlled and variable stimuli required in projected experimental patterns.

Dr. Herman suggested possible use of multiple photographic exposures in slide/tape presentations.

Dr. Forbes in discussing quantification of stimuli suggested that we must be aware that values assigned stimuli are not absolute but relative. Thus we should consider percentage of stimulus as the significant quantity.

It was noted that while facilities were immediately available for experiment in instructional television, music and theatre, the classroom appeared to be the laboratory where the most could be learned most expeditiously during this initial stage of the project. However it is clear that other test situations will be necessary for more detailed and meaningful experimental studies.

ENCABULATOR FIELD TEST NO. 2

The encabulator modification providing greater stability in the presence of ambient environmental conditions was completed early in November and a long test session was conducted at Palm Beach Junior College. The test was conducted in a large air-conditioned classroom before a group of female dental technician trainees. Presentations consisted of the following parts:

a. Introduction and question and answer period conducted by Dr. Brunson
b. Assignments handed out and introduction to Part C by instructor
c. Taped lecture (approximately 20 minutes) prepared by instructor
d. Slide/tape presentations on cleft palate prepared by students.
e. Question and answer period led by instructor.

The radiation sensing element of encabulator was focused on a single student. (See Appendix D, photo 2) Air temperature remained constant. The following observations were drawn from read-out on a numbered scale.

a. The read-out needle was centered at the start of each segment of the presentation; on an average of from 5 to 8 minutes after the start of each segment the read-out needle dropped to zero
b. Needle reaction recorded when instructor informed students they would have to prepare ard present a 5 to 10 minute talk to class.

ENCABULATOR FIELD TEST NO. 3

A third series of tests were conducted at Jupiter High School employing the following equipment (See Appendix D, photos 3-7)

a. Radiation detection element of the encabulator focused on the occupant of one seat.
b. The seat in focus was a chair equipped for measurement of attitude and muscular tension (encabulator chair).
c. Read-out devices consisting of 2 vacuum tube volt meters with 0 to 5 scale placed in a book storage cupboard at the back of the room
d. Two television cameras, one with a wide angle lens to scan the classroom and record the production and the visual reactions of the student in the focus of the encabulator, the other camera recording the readings of the volt meters.

The pictures from both cameras were recorded as a split image on video tape (picture 6 of Appendix D).

Since the students were accustomed to having television equipment operating in the classroom they paid no attention to the experiment in progress.

Two days of tests were conducted. The first day's tests are outlined and evaluated in the following excerpts of a report prepared by Dr. Brunson:

"While the class was marking time meter gave a reading of 2.

"When the instructor focused class on himself the needle moved to 3. A consistent repetition of this phenomenan will be necessary before significance can be ascribed to it.

"The instructor had a series of panels consisting of 6 students who had prepared excellent humorous presentations. When the instructor's opening remarks were concluded and the first panel took over in front of the class, the reading averaged 4 and held its fluctuation within one scale unit.

"At the conclusion of the first panel, the instructor again took over the class and the needle returned to 3.

"When the class was marking time as the second panel took its place the meter reading dropped to 2.

"These procedures were repeated 3 times and the read-out pattern repeated itself on each occasion as described above."

Dr. Brunson concludes: "The machine is in its pioneering stage and will require modification before calibration can be completed, however, it appears to this observer that a major breakthrough in evaluating techniques in the behavioral sciences had been achieved."

During the second day of tests at Jupiter the consultants present for the December 2 meeting observed the program. Both chair and radiation elements of the test apparatus performed satisfactorily. A complete video-tape record of this presentation is available for analysis.

CONSULTANTS MEETING 2 DECEMBER 1968 at BOCA RATON

At the consultants meeting 2 December in Boca Raton the following were present: Dr. F. Ward Brunson, Harold Burris-Meyer, Richmond L. Cardinell, Dean Edward C. Cole, Dr. Edward D. De Lamater, Lewis S. Goodfriend, Dr. Robert Herman, Dr. Robert Kite, Charles H. Vicinus. Absent: Dr. Theodore W. Forbes because of a conflicting commitment. Mr. Donald Oenslager because the detailed analysis and definition of visual stimuli would not be on the agenda until the next meeting. The purpose of the meeting was to permit the consultants to study the instrumentation and facilities in use and project the N-VC experimental pattern and schedule for the next quarter. The program of the meeting involved inspection of Palm Beach County Instructional Television Studios where N-VC initial application to instructional television is scheduled to be undertaken. After a tour of the studios and brief conference with the personnel concerning projected ITV/N-VC joint research program, the test at Jupiter High School was observed.

After the demonstration at Jupiter the consultants considered the program for the rest of the fiscal year. (To February 28 1969). The following tasks were agreed upon:

1. A laboratory must be established where conditions could be held uniform and single individuals tested through a range of emotions, to the end that the sensitivity of the radiation sensing device be established on the basis of possible range of skin radiation. It was estimated by the consultants that this procedure would require several months to obtain cogent results.
2. A wide focus lens system must be applied to the radiation sensor for studies of large audiences. Also multiple radiation sensors and multiple chair elements must be employed for statistical sampling. Modification of the radiation unit is now in progress and tentative arrangements have been made to test the modified encabulator at symphony concerts and legitimate theatre productions in this area.
3. Additional and wider uses of the encabulator should be explored, to the end that expanded application can develop data pertinent to and needed by N-VC research, as for example measuring of tension proposed below.
4. N-VC should seek a variety of test situations in which the information and read-out obtained is combined with and compared to that obtained by established techniques for measuring emotional involvement of individuals and groups. The pre-test of television and cinema productions are examples.

ANCILLARY PROJECTS

1. The medical branch of the Federal Aviation Administration has indicated an interest in the encabulator as a device by which tension of controllers at busy airports could be measured without attaching any device to the controllers. A proposal to this effect was prepared by the medical branch and is now being circulated within the F.A.A. The consultants have agreed that it should be within the scope of the project to make the necessary expertise available to the F.A.A.
2. A recent proposal to N-VC by the Television Research Department of Columbia Broadcasting System concerns the possibility of employing the encabulator in televison program analysis. The CBS proposal will be examined with a view to incorporating it into the N-VC program as it develops, without additional cost to the project.
3. Possible Encabulator uses in the National Defense are being studied. Potential applications are classified information and cannot be expanded here.
4. It has been suggested as a result of N-VC projected study of a drug abuse presentation, that N-VC's emerging techniques for relating emotional change and rate of change to measured and/or recorded stimuli, may find a broad application in the study of multi-media approaches to the solution of this and other social problems.
5. It has been suggested that the encabulator be used as a remote polygraphic device during actual police polygraphic device interrogation, to augment present techniques. Some relationship may thus be found between witting and unwitting reactions of subjects.
6. The peer produced multi-sensory instruction technique appears to have been shown in N-VC test to be a superior educational device. Its commercial exploitation is now under study. (See Appendix D). Its use in this study is primarily for educational test material.
7. Several graduate students at Nova University have expressed an interest in pursuing discrete aspects of the N-VC program as their Doctoral research endeavors. They have been assured assistance in expertise and in bibliographic material in return for such data they may produce.

EXPENSES

It appears that expenses of the project for the first fiscal year will be less than the appropriated funds. Two fortunate circumstances account for this saving, to wit: Dr. Brunson's full time services have been donated to the project by the Broward County Board of Public Instruction, and the encabulator has been engineered and built by Airtronics, Inc. at no cost to the project.

In addition to these savings, the contributions by local school boards in terms of teachers and administrators' time, the use of school buildings and equipment including tape sound reproducers, slide projectors, television cameras and monitors, have made savings possible which will be employed in the expanded activity of the second year.

CONCLUSIONS

In a relatively short period of time the project's test equipment has been developed from basic concept, tested, modified, and retested. Though still in a developing state it is already providing information of importance. These data serve to guide in the further modification and testing of the apparatus. Both staff and consultants agree that this should now be done under controlled laboratory situations where specific meaning can be derived from read-out material and related to the presentations. By the end of a second year we will have developed certain measurable, predictable and mathematically definable associations between stimulus and response. These associations, capable of being repeated, will constitute a basic research pattern indication additional applications.

However encouraging the above appears, we can hardly hope to accomplish in two years what was originally projected for five years. But despite the pressure, when work in progress and projected is completed, it is obvious that the work of N-VC can make a specific contribution not only to education but to fields as diverse as aviation, television, police activity and national defense.

APPENDIX A

Personnel

Dean Edward C. Cole
Branford, Connecticut
Consultant

Yale University School of Drama

In : Who's Who in the Theatre

In: Who's Who in America

N-VC Responsibility: Development of quantifiable presentations.

Dr. Hallowell Davis
Director of Research
Cenral Institute for the Deaf
St. Louis, Missouri
Consultant

In: American Men of Science

N-VC Responsibility: Guidance in discovering and evaluating research bearing on N-VC and in discovery of experimental patterns.

Brigadier General Robert C.
Richardson III, USAF Ret.
Schriever and McKee Associates, Inc
Arlington, Virginia
Consultant

In: Who's Who in America

N-VC Responsibility: Defense applications of N-VC techniques.

Development of test facilities.

APPENDIX A

Personnel

Robert Hayman Kite, Sr.
West Palm Beach, Florida
Consultant

Director of Secondary Curriculum
Palm Beach County Board of Public Instruction

Born Nov. 4, 1930; BAE, University of Florida, 1958; MAE, University of Florida, 1959; EdD, University of Mississippi, 1964. Guidance, University of Miami, 1962; Institute on TECHNIQUES OF PROFESSIONAL NEGOTIATIONS, University of Pennsylvania, 1966; National Training Laboratory, Bethel, Maine, 1968. Elementary school instructor, Dade County, Florida, 1959-62; Instructor and Supervisor of Interns, School of Education, University of Mississippi, 1962-63; Assistant Principal, Cocoa Beach High School, Cocoa Beach, Florida, 1964-66; Coordinator of Social Studies and Assistant Director of Secondary Curriculum, Palm Beach County, 1966-67; Director of Secondary Curriculum, Palm Beach County, 1967-present; Instructor, School of Education, Evening Division, Florida Atlantic University, 1968. Member Phi Delta Kappa, Kappa Delta Pi, Florida Educational Association, National Educational Association, Association for Supervision and Curriculum Development. Governors Conference on Education, National Council for Social Studies, Florida Council for Social Studies, Florida Educational Research and Development Council, Dept. of Supervisors - Florida Educational association.

Publications include: WHO'S AFRAID OF THE BIG BAD WOLF?, The American Weekly, 1959; WHOA OR ZOOM?, The Clearing House, Farleigh Dickinson University Press; WHAT WE DO OR WHAT WE GET, Educational Forum, March 1968.

Research includes: Development of a curriculum guide for seventh year social studies entitled OPERATION 7, 1966-68; wrote and implemented federal project, OPERATION CHALLENGE, March-June, 1967; author of PROJECT: VALUE SEARCH, Winter, 1967.

N-VC Responsibility: Use of N-VC techniques in evaluation of curriculum design.

APPENDIX A

Personnel

Dr. Willard H. Nelson
Plantation, Florida

Director of Research, Broward County Schools
Fort Lauderdale, Florida

B.S., Nebraska Wesleyan University, 1935; M.A., University of Nebraska, School Administration, 1947, Ph.D., Educational Psychology, 1953; University of Illinois, Postdoctoral Fellow, Institute for Research on Exceptional Children, 1958; Four years public school work (teacher, coach, principal); Assistant to Guidance Consultant, University of Nebraska, 1946-47; Educational Director, Nebraska State Reformatory, 1947-48; Instructor, Department of Educational Psychology and Measurements, University of Nebraska, 1948-51; Assistant Professor of Psychology, 1951, Associate 1955-57, Alabama Polytechnic Institute; Associate Professor Psychology and Education, Director of Doctoral Training Program in School Psychology, Florida State University, 1959-66; Visiting Professor, Department of Educational Psychology and Measurements, University of Nebraska, Summer, 1961; Clinical Psychologist, Tri-County Mental Health Clinic, Thomasville, Georgia, 1965-66; Director, Division of Research, Broward County (Florida) Schools, 1966-. Member of American Psychological Association; Southeastern Psychological Association; Florida Psychological Association, Florida Association of School Psychologists; Phi Delta Kappa; American Educational Research Association; Florida Educational Research Association; National Council on Measurement in Education; American Association for the Advancement of Science. Consultant: Marginal Manpower Study (Air Force Contract), 1955-56; U.S. Office of Education Field Reader of Research Proposals, 1965-. Consulting Editor of Journal of School Psychology; Board of Directors, Journal of School Psychology.

Publications include numerous articles appearing in THE PSYCHOLOGICAL RECORD, JOURNAL CLINICAL PSYCHOLOGY: EDUCATIONAL PRESS BULLETIN; PSYCHOLOGICAL REPORTS: PERCEPTUAL AND MOTOR SKILLS.

N-VC Responsibility: Use of the N-VC techniques upon human growth and development.

APPENDIX A

Personnel

James Althouse
President, Althouse Electronics, Inc.
West Palm Beach, Florida

N-VC Responsibility: Maintenance and operation of N-VC test equipment.

George Counts
Research Specialist
Broward County Board of Public Instruction
Fort Lauderdale, Florida

N-VC Responsibility: Bibliographic Research

APPENDIX B

Excerpt from letter from N-VC consultant

Dean Edward C. Cole
Yale University School of Drama

"May I take this opportunity to express the opinion that on the basis of what was shown and the discussions we had the project has a promising future not only in foreseen directions that have only been slightly indicated to date and in totally unforseen directions.

"I was particularly impressed by certain positive responses of the instrument to what must surely have been subject reactions to stimuli in the demonstration involving peer prepared presentations to the mini-unit class at the Jupiter School.

"I was impressed by the obvious competence of your staff and the enthusiasm with which they are attacking the work of the project."

APPENDIX B

Excerpt from letter from N-VC consultant

Dr. Robert Herman
Head, Theoretical Physics Department
General Motors Research Laboratories

"My trip down to the Markham School was most interesting. I'm very pleased that I had an opportunity to do this. I had a good visit around by the principal. The main thing on my mind however concerns the gadget,etc. I indicated this to you already but should like to emphasize that I think that the time has come to do some very simple and very well controlled experiments with the gadget. Could one use the gadget focused on a single subject who would be essentially motionless and try to correlate meter readings with emotional states but simpler yet with skin radiation as it is modified by drugs. I think that the medical people could suggest how to control the peripheral vaso-dilation or contraction effectively and safely. Another thought is that possibly one could get a group of lab rats or mice in a box in the field of view of the gadget in its present form. Thus without waiting for the new lens system etc. one might be able to get an experiment going on the collective reactions of living things to various stimuli whether emotional or drug induced. I am very pleased that you are having a bibliographic search made of all related work. I think that this is very important. I hope that you don't mind these few obvious remarks. The main point is - how can I help you better at this point of the project."

APPENDIX B

Letter from N-VC consultant

Dr. Robert H. Kite
Director Secondary Curriculum
Palm Beach County Board of Public Instruction

"Based on evidence gathered from a variety of highly structured situations, the instrument can be calibrated. Measured emotional involvement can be substantiated with great reliability once this is accomplished. Prior to a reliable calibration, the instrument can be used for gross indications of emotional reaction to stimuli. In my opinion, the instrument can be refined in central situations and used for gross measures of emotional reaction.

"Certainly, calibration assumes priority. It would seem prudent to establish several graduations as project objectives, moving from a simple graduation indicating the extremes of emotion with the more sophisticated graduations projected. This would produce a mutually enhancing research design. With a gross graduation, the instrument could be used in a very practical way, such as measuring emotional reaction in large group testing, guidance and counseling, and threat of a classroom nature. The data gleaned would provide a substantial input for the validation of a more precise calibration.

"Once reliability of a calibration is achieved, the instrument could be used to refine educational programs. Educational theory suffers because of no recent validation process is obtainable when testing educational programs. The literature abounds with warnings that the curriculum must become affective and less cognitive. To date, we have no way to measure emotional involvement. Consequently, it seems apparent that the effective development of an instrument that can provide data relative to emotional involvement demands the greatest priority in education today.

"Other areas that could benefit from such data include:

1. Studio television instructors reading reactions as the lesson proceeds
2. Guidance counselors reading emotional involvement in the counseling situation
3. Developing educational programs to provoke affective responses being evaluated by a reading of actual emotional reaction.

"A basic assumption that could be tested - The greater emotional involvement the greater learning.

"Questions as to how much emotional involvement provides optimum learning, or what type of emotion aids learning could be tested. I see no limitation or area of education that could not benefit from the knowledge of just how involved the child is."

APPENDIX B

Letter from

Benjamin F. Stevenson, Principal
Markham Elementary School
Broward County, Florida

"We would like to express our sincere appreciation for the services which you and your staff are rendering the Markham Elementary School.

"Dr. Ward Brunson and Mr. Charles Vicinus have devoted many hours toward the implementation of the Multi-Sensory Peer-Produced Developmental Reading Program. We believe this program will have significant value for the children we serve. If your project is continued at Markham, we expect to be able through your help to quantify the effectiveness of this approach to instruction as compared with other approaches.

"Please express appreciation to the staff for their extreme dedication and service."

The photographs which make up Appendix C (pages 23-29) have been removed due to their non-reproducibility.

APPENDIX D

PEER PRODUCED MULTI-SENSORY TECHNIQUES

The peer produced multi-sensory techniques developed by Dr. Brunson and used by N-VC in the preparation of test material is based on the assumption that peer responds better to peer than to an adult under ordinary circumstances. In addition, the utilization of peer produced programmed slide/tape productions as teaching devices simultaneously focuses the students' senses of sight, hearing and touch on the learning problem at hand.

The peer produced programs N-VC has been concerned with to date are programmed slide/tape lessons and reading books.

In making a slide/tape lesson, the scenarios are prepared by students and the pictures are indicated or actually taken by them. The processed slides are then placed in sequence by the students and the accompanying dialogue recorded on audio tape. The degree of adult supervision in the process is varied depending upon the age of the students, subject matter and, facilities available.

Peer produced books are developed in the following manner:

1. A child is asked to select a picture from a group of pictures and to make up a story about it.
2. The story is recorded on audio tape as the student tells it.
3. The student then makes 10 to 15 illustrations for the story using colored felt tip markers on tag board.
4. The story is transcribed from the tape by primary typewriter and the appropriate story segment is placed opposite the corresponding picture.
5. The pages of the story are then laminated and spiral bound.
6. The book is placed in the library for the students' use in the same manner as any other book. In addition, the original tape of the story is made available for use by the student reading the book, thus providing aural reinforcement.

The concept of the peer produced book is particularly applicable to use in schools, such as Markham, where the clientele is primarily underpriviledged, and the content of commercially produced books is not directed to the background and interests of this particular socio-economic group.

N-VC test equipment will be used to compare students' response to the peer produced vs. commercially produced book by having an individual student read for the same length of time both varieties of books. Encabulator read-out indications of emotional involvement in both cases will then be correlated.

APPENDIX D

Peer Produced Multi Sensory Techniques
Page 2

Encabulator read-out obtained in testing both slide/tape lessons and books will be compared with data obtained from standard tests: Intelligence, achievement, projective, and interaction analysis. Similar parallel testing will be undertaken with conventionally presented lessons.

AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION

H.E.W. Grant - Project No. 70646
(Short Title: N-VC)

Second Quarterly Report

4 July to 15 September 1968

TABLE OF CONTENTS

Report

Appendix A - Personnel.

Appendix B - Agreement between N-VC and Broward County.

Appendix C - Peer Produced Multi-sensory Productions Available for Test Purposes.

Appendix D - N-VC Produced Test Presentations.

Appendix E - Precis of N-VC Project.

Appendix F - Report of Expenditures.

The program projected for the second quarter (First Quarterly Report, page 5) has progressed in a generally satisfactory manner.

The collection of reference material for the bibliographic study under Dr. Forbes, Mr. Vicinus, Mrs. Beyer, appears to be substantially complete.

Mr. Cardinell's scheme for expressing the relationship of musical stimulus to emotional response is under study. This type of codification can be applied to slide/tape presentations.

Initial disclosure of the Project was made by Mr. Burris-Meyer before an international audience at The 6th International Congress on Acoustics, in Tokyo. The paper (Appendix D in the First Quarterly Report) was well received and elicited helpful comment. Contact has been made with one project at the University of Maryland studying relative effectiveness of visual and auditory stimuli, and one at U.C.L.A.involving emotion induced measurable responses in the brain. It has been suggested that Mr. Burris-Meyer present an invited follow up paper at the 7th Congress in Budapest in 1971.

ORGANIZATION

Since 1 July N-VC has had the full time services of Dr. F. Ward Brunson, educational psychologist and member of the Research and Development Office of the Broward County Board of Public Instruction. Dr. Brunson has been assigned to N-VC by Dr. Willard Nelson, Director of the Research and Development Office, pending formal approval of the agreement already in effect between N-VC and Broward County Board of Public Instruction (Appendix B). The agreement has been approved by Acting Superintendent of schools for Broward County, William T. McFatter, and N-VC Grants Officer, R. T. Alexander. Formalizing the agreement awaits presentation to the members of the Broward County Board of Public Instruction. At Acting Superintendent McFatter's request a Precis of the Project was prepared for use by board members (Appendix F).

During the quarter a full time secretary has been employed.

Dr. Robert Kite, Director of Secondary Curriculum, Palm Beach County School System, has been added to the group of consultants.

FACILITIES

Facilities available for N-VC test purposes in the areas of institutional television at the Palm Beach County Media Center, legitimate and musical theatre at the Palm Beach Royal Poinciana Playhouse, and motion pictures at Empire Motion Picture Studios remain as in the last report. Operations will move into these facilities as availability of Encabulator permits.

In addition the following educational facilities have been made available to N-VC. It is expected that the initial Encabulator calibration and operational testing will take place in these facilities:

1. The secondary schools of Palm Beach County through an experimental program at Jupiter High School under the supervision of Dr. Robert Kite, Director of Secondary Curriculum, Palm Beach County School System. Dr. Kite proposes to use N-VC test equipment to study effectiveness of a mini-unit curriculum he is developing. The curriculum employs programed audio-visual material to be used at the individual level. Each unit must depend for its effectiveness, upon the degree of built-in motivation it carries. N-VC is participating in planning individual programs to include measurable elements, and will measure the effect of the test programs.

2. The Office of Vocational Rehabilitation of Palm Beach County is available to N-VC

    1. To test counselor training programs and

    2. In collaboration with the county school system to undertake a study using peer produced multisensory techniques in motivating emotionally disturbed high school children.

3. The Broward County Junior College experimental reading program is available to N-VC for test purposes.

4. The education department, Florida Atlantic University is developing T.V. films for education courses. N-VC has been invited to participate and will have considerable control over quantifiable stimuli in these films. Presentations can then be tested as a whole or in part against standard lecture presentations similarly tested. Measured emotional involvement in both types of presentation can be compared with student accomplishment conventionally tested.

5. The Markham School in Broward County has been the center of operations for N-VC this quarter and will

continue in this capacity into the next. Most of the students are the children of Negro migrant workers. The Director of Research and Development for the county school system, the Director of Migrant Education and the principal of the school jointly sponsor an N-VC study at Markham school and have offered full cooperation of personnel and use of facilities of the school.

Two teacher coordinators have been assigned to work with N-VC. The school has adequate audio/visual equipment and material, and a closed circuit T.V. unit which is an essential part of the required instrumentation.

At no cost to N-VC, Assistant Director has established in his home photographic lab facilities to process color film, thus eliminating high cost and time lag of commercial processing.

TEST EQUIPMENT

The radiation unit of the Encabulator has been completed and is under test at Airtronics. The test chair has been forwarded to Airtronics for modification. Mr. Goodfriend has outlined a procedure for computer assisted analysis of the read-out which will be studied for applicability when both sections of the Encabulator are in use.

OPERATIONS

The salient feature of this quarter's operations has been the development of test programs for use in schools, employing peer produced multi-sensory teaching techniques. These techniques involve the production by students of presentations of the subject, using slides, film, audio tape and live performances recorded on video tape. The system was originated by Dr. Brunson. Its application is under his supervision. Conventional tests show it to be much more effective as a teaching technique than are conventional classroom procedures. The system's effectiveness has been assumed to result from the children's emotional involvement in the process of preparing and presenting the subject. N-VC will endeavor to establish or disprove the fact and extent of such involvement.

N-VC can effectively pursue its objectives. Through this technique because of several features, viz

1. Presentation contains many measurable stimuli
2. Environmental conditions are controllable
3. The stimulus can easily be altered for repeat presentations.

5. Audiences may be tested for involvement in multi-sensory as well as conventional presentations.

It therefore appears that N-VC procedures can be useful in pre-testing and projecting new teaching techniques as well as establishing their effectiveness relative to conventional teaching methods.

As of this date one instructional program has been completed and nine are in work at Markham School. Two teachers and one technician have been assigned by Principal Benjamin F. Stevenson to work with the N-VC staff in the preparation of test programs.

PROGRAM

The radiation section of the Encabulator is scheduled to go into operational test before October 15th. An engineer from Airtronics will operate it and train a staff technician. A staff technician will be employed. The seat section of the unit is scheduled to be ready by November 1st.

A consultants meeting is scheduled to take place in Detroit on October 20. The agenda will include

1. Review and criticism of operations by the consultants.

2. Projecting of operations through December.

3. Development of contacts for supporting projects.

The basic program of designing and measuring a presentation, testing it, revising it on the basis of test results and retesting can now be undertaken in already prepared facilities as soon as the test apparatus is in hand.

APPENDIX A

PERSONNEL

Dr. F. Ward Brunson
West Palm Beach, Florida
Consultant

Psychologist, Broward County Board of Public Instruction, Department of Research and Development.

B.S., University of Nebraska; M.A., University of Nebraska; E.D.D., University of Nebraska; Guidance Director, District 46, Sarpy County, Nebraska; Part time instructor, University of Nebraska; Teacher, South High School, Omaha, Nebraska; Coordinator of Evaluation and Inservice Training, Omaha, Nebraska; School Psychologist, Omaha, Nebraska; School Psychologist, Palm Beach County, Florida; Curriculum Psychologist, Palm Beach County, Florida. Member of Phi Delta Kappa; National Educational Association; Florida Educational Association; Council for Exceptional Children; American Association on Mental Deficiency; Florida Educational Research Association.

Publications include "Creative Social Studies Teaching of the Culturally Disadvantaged"; Education and Guidance of Disadvantaged Children and Youth: A Resource Reader"; "Student to Student Instruction".

N-VC Responsibility: Direct N-VC program as applied to teaching. Prepare reports as necessary for psychological and educational journals.

PERSONNEL

Mrs. Susye Johnson,	Markham School - Coordinator assigned to N-V as needed.
Mrs. Adele Anderson,	Markham School - Coordinator assigned to N-VC as needed.
Mr. Manfred Johnson,	Broward County Board of Public Instruction Research and Development Staff. Available to N-VC as needed.
Mr. Gainus Wright,	Markham School Director of Audio-Visual Materials - Available to N-VC as needed.

APPENDIX B

An agreement between Florida Atlantic Ocean Sciences Institute, Inc. as administrator of Department of Health, Education and Welfare Grant Number 7-0646 (An Inquiry Into the Educational Potential of Non-Verbal Communication (N-VC) and the Broward County Board of Public Instruction.

This instrument gives effect to an agreement which has been informally implemented since 1 July 1968.

Partners to this agreement subscribe to the following:

1. To undertake an investigation designed to improve teaching techniques through the presentation of instructional material using multi-sensory procedures and the objective recording of the effectiveness of the procedures.

2. That the investigation is to be conducted under the guidance of Dr. F. Ward Brunson of the Research and Development Department of the Broward County Board of Public Instruction with the assistance of personnel of the Broward County Board of Public Instruction and expertese and personnel of N-VC Project.

3. That the results of the investigation will be published jointly in the names of both parties to this agreement.

4. That the N-VC Project purchase the full-time services of Dr. Ward Brunson. Price for services of Dr. Brunson to be computed at the rate of $14,000 for an academic year. Florida Atlantic Ocean Sciences Institute, Inc. agrees to pay compensation for Dr. Brunson's services as follows: $4,666 on 15 August 1968, $4,666 on 1 November 1968 and $4,668 on 1 February 1969. At the expiration date of the N-VC contract (1 March 1969), parties to clearly review their mutual obligations.

5. That Dr. Brunson will begin his duties with N-VC immediately and will continue with the Project until its expiration date or until such time as both parties agree his services are no longer required by N-VC.

6. That while serving with N-VC, Dr. Brunson will remain a member of the staff of the Broward County Board of Public Instruction and entitled to all the benefits and seniority of his position. Dr. Brunson will continue to be paid by the Broward

County Board of Public Instruction at his present negotiated rate.

7. That Dr. Brunson is to serve N-VC as psychologist in all N-VC projects and to prepare the appropriate papers for the psychological journals. Dr. Brunson to guide N-VC personnel in preparation of experimental multi-sensory testing presentations.

8. That the Broward County Board of Public Instruction at no expense to Florida Atlantic Ocean Sciences Institute, Inc. or the N-VC Project, will assign a portable classroom at the Markham School for the exclusive use of N-VC and will equip the classroom with all teaching aids, tape recorders, and Video Tape recorder for simultaneous observation and recording of teaching presentations, students and test equipment read-out.

APPENDIX C

PEER PRODUCED MULTI-SENSORY

PRODUCTIONS AVAILABLE FOR TEST PURPOSES

1. KOREAN WAR
2. SPANISH AMERICAN WAR
3. WORLD WAR II
4. ROMAN ARCHITECTURE
5. GLADIATORS
6. COTTON KINGDOM
7. LINCOLN (2 SHOWS)
8. SLAVERY
9. TEXAS
10. JEFFERSON
11. DEPRESSION
12. CUBAN CRISIS
13. MC ARTHUR
14. MARIE CURIE
15. GEORGE WASHINGTON
16. PANAMA CANAL
17. GREEK MYTHOLOGY
18. MEDIEVAL EUROPE
19. ROME

A. Each program is 15-20 minutes long containing 20 slides.

B. Programs made by 10th and 11th graders for that grade level. For test purposes programs could be shown to lower grades.

APPENDIX D

N-VC PRODUCED TEST PRESENTATIONS

PREPARED AT MARKHAM SCHOOL FOR DISADVANTAGED CHILDREN

1. "A Visit to an Art Gallery"
2. "Welcome to Markham School"
3. "Early Childhood Vocabulary Building" - Objects Found in the Home
4. "Do's and Don'ts Around the Home"
5. "A Visit to a Home Under Construction"
6. "Early Childhood Vocabulary Building" - Types of Houses
7. "Field Trip to the Larger Community"
8. "Citrus Fruit"
9. "Markham Student Council"

    A. Programs vary in length from 10 to 30 minutes and contain from 20 to 80 slides.

The multi-sensory productions proved a variety of non-verbal stimuli in the areas of sound, color, and time which N-VC can codify and test. Photography at either the Markham School, or on location in Palm Beach or Broward County, and each was planned to be modified in a number of ways. Modifications would constitute a quantifiable non-verbal communication element.

Below are listed a few general modifications used to the extent that they involve measurable elements. In addition each presentation has suggested particular variations or modifications.

A. Emotional quality of musical background as per Cardinell scale.

B. Length of time slide remains on screen.

C. Peer versus adult narration.

D. Sound level of musical background.

E. Subject content of slides.

APPENDIX E

An Inquiry Into the Educational Potential of
Non-Verbal Communication
(H.E.W. Grant - Project No. 70646)
Principal Investigator - Harold Burris-Meyer

PRECIS

This is a study in which emotional responses to mathematically defined and controlled non-verbal stimuli, such as sound, music, light, flicker effect and color are detected and measured in terms of their physical concomitants. The controlled stimuli presentation is then modified for greater effectiveness on the basis of test results. The process can be repeated until the most effective presentation is achieved. From many similar tests a general presentation theory may be derived and tested.

The application of this study ranges from merchandising to opera. The limitations of the present grant confine the research to its educational potential.

If emotion can be more effectively communicated than it is now, if our classroom presentations, which are equally verbal and non-verbal, are based on more than tradition or hunch, if we can test the effectiveness of communication of emotion; we can teach better. If we can engage the emotions of the student in any subject, once engaged, we can teach more effectively because we can measure results of repeated tries objectively and instrumentally. Equally important to education, since classroom performance of the teacher is a teaching device, we can have better performances.

In studies of music in industry and the theatre, it has been shown that subjective response to a stimulus is not always the real emotional response. The subject often records what he thinks he ought to report rather than what he really feels.

Therefore the apparatus required by the Project for measuring emotional state, change, and rate of change will be unique in that the subjects will not know they are being tested. Therefore it is the first unweighted and true response that will be measured.

The apparatus consists of:

1. A radiation measuring device which measures radiation from skin of the subject at a considerable distance. Skin radiation is controlled

by vasomotor activity, a reliable well understood index of emotional state, change, or rate of change.

2. A chair equipped to measure change of bodily attitude of occupant. The effectiveness of this device depends on the fact that many emotional changes are reflected by muscular movements where rate, amplitude and direction have a direct relationship to the emotion involved.

These devices give a combination of data which constitute a signature, identifying an individual subject or group of subjects. The devices may be employed with audio and/or visual tapes of the presentation for direct comparison of stimulus and response.

The devices are physically discreet so that they can remain undetected by the group under observation and read-out devices can be at some distance from the presentation.

Pilot models of the devices were developed under Rockefeller Foundation Research Corporation and Stevens Research Foundation Grants and proved out in technical tests. Refined models are now being engineered by a research and development firm.

The Project involves many undertakings whose magnitude and direction it is not always possible to predict, thus the work of the Project is carried on largely through the work of consultants who are called upon for advice and work as needed. A partial list of consultants to the Project follows:

Richmond L. Cardinell- - - - Montclair, New Jersey; former Director of Research for Muzak Corporation and President of Magnetic Programs, Inc.

Dr. Edward O. DeLamater- - - Boca Raton, Florida; Distinguished Professor of Science and Dean, College of Sciences, Florida Atlantic University.

Dr. Theodore W. Forbes - - - East Lansing, Michigan; original Researcher in Psycho-Acoustics; Professor of Psychology, Michigan State University.

Lewis S. Goodfriend - - - -	Cedar Knolls, New Jersey; Editor SOUND AND VIBRATION; President Goodfriend-Ostergaard Associates, Inc.
Dr. Robert Herman - - - - -	Royal Oak, Michigan; Head of Department of Applied Mathematics, General Motors Corporation.
Donald Oenslager - - - - -	New York, New York; Professor, Yale School of Drama and set designer of over 150 Broadway productions.

AN INQUIRY INTO THE EDUCATIONAL POTENTIAL OF NON-VERBAL COMMUNICATION

H.E.W. Grant - Project No. 70646
(Short Title: N-VC)

First Quarterly Report

26 February, 1968 to 3 July, 1968

TABLE OF CONTENTS

Report

Appendix "A" - Personnel

Appendix "B" - Proposed Agreement with Broward County Board of Public Instruction - Research Dept.

Appendix "C" - Memorandum of Tentative Agreement with Airtronics, Inc.

Appendix "D" - Acoustical Problems in Non-verbal Communication

Appendix "E" - Revised Budget

Appendix "F" - Report of Expenditures

The proposal which defined this project contains the following abstract:

"Objectives

A. To identify the recent developments in the physical and life sciences which may be useful in preparing, presenting and projecting the audio and visual elements of the theatre, and dance, music and the plastic arts.

B. To develop presentation theory from those findings and from the analysis of classical art forms. To apply the theory to dramatic and educational presentation forms and develop therefrom improved presentation techniques.

C. To validate these techniques by measuring the emotional involvement of audience.

D. To test and demonstrate the application of the presentation and testing techniques here developed to educational processes in the arts and in other disciplines.

E. To make the findings available to the arts, education and the physical and life sciences.

Procedures

A. Survey the voluminous literature in pertinent fields published since 1947. A survey up to 1947 has been made.

B. Undertake a reconciliation between the mathematically expressible elements of the stimuli studied and classical art forms.

C. Employ the findings above (B) in developing improved presentation techniques (classroom, stage, etc.)

D. Validate techniques by instrumental measurement of audiences.

E. Restudy and refine presentation techniques on the basis of test (D).

F. Disseminate findings by demonstrations, reports, illustrative motion pictures, video tape, seminars".

TASKS

In pursuing the stated objectives, the following tasks have been undertaken:

1. Organization: To assemble a staff and a group of consultants.

2. Physical Facilities: To arrange for test facilities and working office space.

3. To arrange for re-engineering, building and testing of the test apparatus (Encabulator) and develop a facility for its use and maintenance.

4. To proceed with the operation of the project as outlined in the proposal section PROCEDURES, above, as rapidly as facilities could be developed.

ORGANIZATION

It was originally intended that most of the work of the project would be undertaken by full-time staff members. The starting date was late for employing academic people with appropriate qualifications, especially in view of the fact that few would be available until September, 1968. It was, therefore, necessary to revise the organization to place principal reliance on a team of eminent consultants. This policy has the advantage of providing a greater diversity and competence in the skills which must be brought to the project than would be likely in a small, full-time staff. The full-time contingent, therefore, will assist the consultants and coordinate their activity and supervise and conduct testing.

The group of consultants is not complete. Its make-up will vary as requirements for various types of expertise change. Appendix "A" lists the current members. The permanent staff as set forth in Appendix "C" reflects the organizational change. It will be noted that the billet of mathematician has been eliminated. The billet of Assistant Director has been filled. The search for a qualified psychologist, assisted by the consultants, the placement service of the American Psychological Association, the Deans of Arts and Sciences of Brown, Nova, and Miami Universities appears to have been successfully completed. An arrangement is pending whereby NV-C will supply the encabulator and program planning guidance to the Research Department of the Broward County Board of Public Instruction in a program supporting NV-C, and the Board will supply the NV-C staff psychologist (Appendix "B")

The engineer/technician will be assigned by the organization which is building the test apparatus (Encabulator). He will be employed by NV-C when the apparatus is complete.

Secretarial and accounting assistance have been available through Ocean Sciences Institute. A full-time secretary is provided in the revised budget. (Appendix "B")

PHYSICAL FACILITIES

Offices for the staff have been established at the Ocean Sciences Institute, 604 Park Drive, University Park, Boca Raton, Florida. Office equipment is supplied by the Institute and the Director. A few items have been purchased.

The facilities for tests in mass media have been arranged as follows:

1. The Palm Beach County Instructional T.V. organization has agreed to collaborate with N-VC in preparation of teaching programs, and to provide test facilities at its studios and in the schools. Arrangements for similar cooperation with the Broward County Instructional Television are under study. (Appendix "B").

2. Test facilities in connection with legitimate and musical plays have been promised by Royal Poinciana Playhouse in Palm Beach.

3. Empire Motion Picture Studios in Ft. Lauderdale has agreed to provide test facilities for N-VC.

Tests in the theatre will initially be for the calibration of test instruments in use. In connection with motion pictures, the test will be of rushes of the day's shooting as a guide to retakes.

TEST APPARATUS (ENCABULATOR)

Airtronics, Inc. of Herndon, Virginia, is an engineering and development company, which designs and manufactures classified and unclassified electronic equipment, principally for the U.S. Navy.

A tentative agreement has been reached with Airtronics whereby that organization will build the pilot model and subsequent copies of the Encabulator at no cost to N-VC. (Appendix "C") The first test circuit was successfully demonstrated on May 27, 1968. Lewis S. Goodfriend and Joseph McCord, consultants, both of whom worked with the original Mark I Encabulator, are collaborating on design and on test procedure.

OPERATIONS

To carry out the procedure set forth in the original proposal, the following steps have been taken:

1. A mass of pertinent published material assembled over the past twenty years is being codified and winnowed. The consultants have supplied numerous references. Arrangements have been made to use the information recovery facility of the Defense Documentation Center and the Reference and Referral Service of the Library of Congress, to assemble the necessary complete bibliography. Pertinent classified material will be studied at the cognizant defence activity, obviating the complications of handling classified documents at N-VC headquarters.

2. As a step in quantifying auditory stimuli, Dr. Herman, Mr. Cardinell and Dr. Forbes are scheduled to go to the Bell Laboratories in September to work with the computer music project. Mr. Cardinell has produced from his hitherto unpublished studies, an initial scheme for expressing the relation of a musical stimulus to an emotional response.

3. Conferences have taken place as the initial step in establishing of associated projects with the research departments of Metromedia and General Motors. It is anticipated that a number of organizations will originate or modify existing research projects which will supply N-VC with essential data, in exchange for data and guidance from N-VC. N-VC has agreed to prepare a project precis for Kenneth Clark, Executive Vice-President of the Motion Picture Association of America, for him to present to the Directors' Guild of America, the Writers' Guild of America, the Producers' Guild of America, as the first step in developing N-VC support projects in those organizations.

4. It was determined at the consultants' meeting of 19 May that such measurement of stimuli as might be needed at the outset could be made as part of devising of programs. The mathematical relationship between stimuli and test results can be undertaken by consultants. Dr. Herman has undertaken to procure all the mathematical support the project may require. A staff billet for a mathematician is thereby eliminated.

5. It has been agreed that initial public disclosure of project program and results will be made through the media and with the guidance of Messrs. Heckinger and Kone, of the New York Times and American Institute of Physics, respectively.

6. Devising of presentations from data in hand and with facilities of Palm Beach County Instructional television will begin during July under the Assistant Director.

7. N-VC is being monitored for defense implications and applications by a staff section of the Joint Chiefs of Staff and CNO Op 345.

PROGRAM

A program projected through the second quarter includes:

1. Establishing test facilities and start of audience measurement in Ford's Theatre, Washington, D.C. and Markham School in Ft. Lauderdale.

2. Establishing contact with investigators and research programs in allied fields in the United States, Europe and Japan. Assisting in establishing supporting projects.

3. Review and winnowing data already collected, including considerable unpublished material and distribution thereof to the consultants. This may require some part-time assistants.

4. Initial calibration of the Mark II Encabulator.

5. Presentation planning as previously noted.

6. Initial public disclosure of the program at the 6th International Congress on Acoustics.

7. Consultants' meetings to review progress and assign new and continuing responsibilities and set up program and schedule for the third quarter.

APPENDIX "A"

Personnel

Harold Burris-Meyer
Boca Raton, Florida

In: Who's Who in the Theatre
In: American Men of Science

N-Vc Responsibility: Principal Investigator.

Dr. Edward Doane DeLamater
Distinguished University Professor of Science and
Dean, College of Science
Florida Atlantic University
Boca Raton, Florida

In: American Men of Science

N-VC Responsibility: University Liaison and Scientific Advisor.

Dr. Theodore W. Forbes
Lansing, Michigan
Consultant

Psychologist, Professor, Michigan State University. Original researcher in Psycho-Acoustics. Former Research Psychologist Stevens Institute of Technology; National Defense Research Committee; Harvard University Psycho-Acoustic Laboratory.

In: American Men of Science

N-VC Responsibility: Measurement and interpretation of pscho-physical responses to audio and visual presentations.

Lewis S. Goodfriend, P.E., FASA, FAES
Cedar Knolls, New Jersey
Consultant

President, Goodfriend-Ostergaard Associates, Inc., Consulting Engineers in Acoustics. Editor - Sound and Vibration. Former Editor - Noise Control. Co-author, with Harold Burris-Meyer, Acoustics for the Architect.

In: American Men of Science

N-VC Responsibility: Supervision of Encabulator design. Conducting initial calibration tests.

APPENDIX "A"

Personnel

Richard L. Cardinell, P.E., FASA
Montclair, New Jersey
Consultant

Acoustical engineer, musician, composer of program for psychiatric screening under National Defense Research Committee, Director of the Cardinell Corporation, Former Director of Research for Muzak Corporation, President of Magnetic Programs, Inc. and Director of Research in Functional Music at Stevens Institute of Technology.

N-VC Responsibility: Development, definition and presentation of auditory stimuli.

Dr. Robert Herman
Royal Oak, Michigan
Consultant

Head of Department of Applied Mathematics, General Motors Corporation.

In: American Men of Science

N-VC Responsibility: Mathematical techniques - quantifying stimuli, relating stimuli to measured response.

APPENDIX "A"

Personnel

Joseph McCord
Santiago de Chile, S.A.
Consultant

Electrical engineer, International Telephone and Telegraph Company; Former Research Engineer NDRC Project 17.3-1; Chief Engineer Magnetic Programs, Inc.; Chief engineer, Research in Sound in the Theatre, Stevens Institute of Technology. Designer of Mark I Encabulator.

N-VC Responsibility: Apparatus development and operation.

Richard T. Morgan
Boca Raton, Florida
Consultant

Assistant Professor, Florida Atlantic University

N-VC Responsibility: Computer Applications.

Donald Oenslager
New York, N. Y.
Consultant

Stage Designer; Professor, Yale University

In: Who's Who in America

N-VC Responsibility: Assistance in developing visual presentations for test

APPENDIX "A"

Personnel

Charles H. Vicinus
Deerfield Beach, Florida
Assistant Director N-VC

BA, Antioch College; MFA Yale University; past Managing Director of the Springfield, Ohio Civic Theatre; Trotwood, Ohio Circle Theatre; and the Edyth Bush Theatre of Hamline University, St. Paul, Minnesota. Experience with the Antioch Area Theatre, Yellow Springs, Ohio, Shakespeare Festival; Oak Bluffs Playhouse, Oak Bluffs, Mass.; and the York Playhouse, York, Penna. Directed over 50 productions during this period. Past Acting-Director of Theatre at Hamline University in St. Paul, Minnesota, where in addition to teaching a wide variety of courses, he initiated a program of a touring theatrical improvisation group. Past member of the editorial board of the Hamline Review. Former Assistant Manager of the Antioch Press, Yellow Springs, Ohio. Publication include articles in Theatre U.S.A. and the Minneapolis Star and Tribune. Member of the American Educational Theatre Association and American National Theatre and Academy.

N-VC Responsibility: Coordination of operations. Development of presentations.

APPENDIX "B"

3 July 1968

AID MEMOIR: Conferences on Proposed Collaboration between N-VC and Broward County Board of Public Instruction.

OBJECT: To develop a single facility and procedure to carry out the complete program of N-VC, as it applies to teaching from first grade through junior college.

PRESENT: Dr. Ward Brunson, Psychologist, Research Department, Broward County Board of Public Instruction, Acting for Dr. Willard Nelson, Director of Research and Development; Harold Burris-Meyer, Principal Investigator, H.E.W. Project 7-0646; and Charles Vicinus, Assistant Director.

TENTATIVE AGREEMENT:

1. N-VC to purchase the full-time services of Dr. Ward Brunson as Staff Psychologist for one year from Broward County Board of Public Instruction at ca. $14,000.00.

2. Broward County Board to assign a portable classroom exclusively for N-VC use, and equip it with all teaching aids, and multi-channel television pickup for simultaneous observation and recording of teaching presentation, students and encabulator readout. Broward County Board to supply technical and instructional staff at no cost to N-VC. N-VC to supply encabulator and encabulator technician as required.

3. Experimental teaching presentations in multi-media to be developed under guidance of Dr. Brunson and Mr. Vicinus and tested beside conventional presentations, in a variety of grades and social groups.

4. The site for the test to be Markham School in Broward County chosen because most progress can be anticipated with disadvantaged children, and since Federal and State agencies who may wish to duplicate or expand the project follow the work of Markham School closely. Classes from other schools, high schools and Junior College be brought to the facility for testing.

5. Dr. Brunson to serve N-VC as Staff Psychologist in all other N-VC projects as needed, and to prepare the appropriate papers for the Psychological Journals.

6. This proposal to be implemented immediately on endorsement by the authorizing authorities.

APPENDIX "C"

27 May 1968

AID MEMOIR: Conference on Development of the Encabulator

Present; Professor Harold Burris-Meyer, Dr. F. Corwin McAndrews,
Mr. Robert K. Byard and Mr. Gerald Stanley

The following procedure and responsibilities in development of the encabulator were proposed;

1. Airtronics will design and build the breadboard device using available standard components wherever possible.

2. The device when completed and technically tested will be turned over to Ocean Sciences Research Institute for calibration in use and development of test procedures.

3. Airtronics will nominate and Ocean Sciences employ an Engineer/Technician to do the actual testing and make such modifications as are indicated or required in use and needed for the production of MARK III.

4. Public disclosure will be limited as far as the research uses permit until means for control and public exploitation have been devised and are in effect.

5. Interested parties will explore the means by which commercial exploitation could be most profitably undertaken. In conferences between Airtronics and Ocean Sciences, with available costs in hand, a projected organizational and operational pattern for exploitation will be developed.

6. Envisioned as possible users of a service are: Psychological research, motion pictures, radio, t.v., advertising and any enterprise in which an emotional involvement of groups of people is important.

7. The relative responsibilities and interest in the development and use of the encabulator may, for purposes of discussion, be defined as follows:

Airtronics: designer and builder of the device will either retain ownership and lease to users or will sell to users and participate on a continuing basis in the profits from such use.

Ocean Sciences will develop the operational procedures, calibrate the device in use and supply continuing guidance and instruction to the using organizations including progressive refinement of testing procedures and such other research and experiment in the use of the device as may be necessary to protect the enterprise and increase a scope of its application.

July 2, 1968

"ENCABULATOR", A.I. #500300

STATUS REPORT

Assembling radiation monitor using smaller reflector until new reflector (8" diameter) is received - Ainslie will ship it Friday July 5, 1968. We have received strain gages and will proceed to assemble the seat monitor as soon as we have completed the assembly and check-out of the radiation monitor.

A study is also under way regarding DDC document on Personnel Detection and Security Systems. This document (classified) deals with

a. Seismic and Acoustic Surveillance and Detection
b. Chemical and Bio-Sensing Systems
c. Optical and Visual Detection
d. Night Observation Devices
e. I.R. Surveillance

Airtronics, Inc., hopes to have the radiation detector in test by July 12, 1968.

Per Mr. Byard's telecon with Mr. Louis Goodfriend, an interest was indicated in this system for use in the Ford Theater, now being restored by Mr. Goodfriend.

APPENDIX "D"

THE 6TH INTERNATIONAL CONGRESS ON ACOUSTICS

Tokyo, Japan, August 21-28, 1968

ACOUSTICAL PROBLEMS IN NON-VERBAL COMMUNICATION

by

Harold Burris-Meyer

Florida Atlantic University, Boca Raton Florida

DEFINITION

Non-verbal communication in the context here presented is an art. It is the communication of emotion as opposed to the communication of information. The end-point of non-verbal communication is to involve the subject emotionally to the point where he acts on the basis of the emotion stimulated or communicated. The stimulated action may consist in physically or intellectually doing something which might not otherwise have been undertaken; or in the adoption of an attitude or position against which facts or phenomena are judged or evaluated.

Carried to its logical and simplest conclusion, non-verbal communication can be the source of motivation. The understanding of non-verbal communication can be the salient factor in explaining why we do the things we do.

HISTORY

The history of acoustics in non-verbal communication is long and is documented in ancient Greek and Biblical literature.[1] But lack of controls of the stimulus or definite measurement of induced response has given an aura of folk-lore to the ancient reports, and has encouraged two popular but unjustified assumptions. First: that induced action through the control of the emotional determinants thereof is a nonsensical concept because of the absence of techniques for precise definition of the stimulus and measurement of the response of the subject. Second: that music, defined only in musical terms, when used in hospitals can induce predictable and beneficial responses in subjects with such reliability as to constitute, in fact, a therapy.[2] The first attitude has resulted in an unwillingness on the part of acoustical and psychological researchers to take the subject seriously; the second has been accompanied by a wave of charlatanism, which further inhibits serious consideration.

However, a few attempts to achieve communication of emotion by auditory means have involved sufficiently precisely defined stimuli, exact repetition, careful observation and, to some extent, measurement of the subject to indicate that further studies involving precision sufficient to establish truth can be undertaken profitably. Prominent among these indicators are: the observed audience response to the Brainstorm in Elmer Rice's ADDING MACHINE.[3] This has been extensively reported. It resulted in considerable anger induced by a 32-second, largely auditory presentation. And there was

functional music, in which auditory stimulus was given much more precise definition than was usual in describing music, and in which the emotional involvement of the subject was measured in terms of his performance while at work. Functional music[4] was the subject of careful study for some years and was able to induce a change in the performance of people at work, predictable within a few percent.

The BJ spectra[5] of non-meaningful and non-associative sound induced reportable and observable nervous tension. An auditory presentation accomplished rough screening of Naval personnel for indications of nervous instability.

THE PROBLEMS

Only since the electronic generation and measurement of sound has it been possible to define an auditory phenomenon with great specificity, reproduce it precisely, and relate it mathematically to a measurable effect. Possible it is, but the difficulties are considerable. An auditory stimulus expressible in an art form is extremely complex, involving not only the spectrum but the intensity and time. The best we have been able to do so far is to devise a normal-appearing presentation which involves phenomena such as startle or flicker, which have been shown in the laboratory to have identifiable effects, measure the critical elements, record the program and reproduce it under controlled conditions.

In addition to the problem on quantifying the stimulus, there is the problem of getting an unweighted response from the subject. If we control the environment by putting the subject in a calorimeter or anechoic chamber, he knows that he is a subject, and this knowledge introduces an indeterminate variable into his response, which makes any measurements taken under such tests valueless. It is therefore necessary to measure the response of the subject without his knowledge of the fact that he is a subject.

One more problem lies in the fact that subjects may not all respond uniformly, and it can be argued that results obtained for one individual may not apply to another. Though evidence to support this theory is not convincing, there is a potential problem which must be solved or circumvented.

Finally, if we are to improve the effectiveness of communicating emotion, we must relate the measured response to the measured stimulus to the end that we can prescribe a mathematically defined auditory phenomenon and achieve a predictable, uniform, measurable response when the subject is exposed to it. This will, in effect, be deriving a law.

PROGRAM

The project now in process undertakes to gain sufficient understanding of non-verbal communication to make its technically planned application feasible and the emotional involvement of the subject, predictable. As a starting point for our efforts to quantify the auditory stimulus,we have a small body of psychological literature, reports from indicative historical episodes, dance notation, and a number of mathematical approaches to music

such as those evidenced by computer composition and, of course, the Schillinger method of musical composition. Also, since response to an auditory stimulus may be influenced by what is seen, it is necessary similarly to quantify visual stimuli, and that endeavor is also under way. Though it is not subject to this paper, it should be noted that, when the visual stimulus is measured, it should be possible to effect a reconciliation between visual and auditory stimuli to the end that we shall know how stimuli in the two media can reinforce, counterpoint, or cancel each other.

Finally, we are undertaking to measure emotional involvement; emotional state, change and rate of change, in terms of the physiological concomitants thereof. Physiological indices of emotional condition are numerous. We have determined first that we must measure the individual without his knowing he is being measured, and this rules out all devices attached to the individual or all test environments which are patently test environments. The subject must be measured as he sits in the theatre or listens to the record player at home, or watches the television or operates a lathe in a factory. Some physiological indices are remotely detectable and measurable. Measurements reduced to graphic form give a distinctive signature related to degree of emotional involvement.

LIMITATIONS AND IMPLICATIONS

Anticipating the objection that different individuals respond differently to similar presentations, we direct our presentation and test to mass media and people en masse. Also, we recognize that it is vain to anticipate the early development of techniques that will be universally effective. But even a small percentage of gain in the emotional impact of a message can win an election. A law relating stimulus to response can help the artist to learn his art more surely and to sing his song to more men. And the teacher can devise a scheme for learning for any age and place which carries its own built-in motivation. Perhaps we may even hope that man may yet win in the race between education and catastrophe.

1. JASA, V. 17, No. 3, p. 232
2. Soibelman, Doris, Therapeutic and Industrial Uses of Music. Columbia University Press, N. Y. 1948
3. JASA, V. 11, p. 348
4. Mechanical Engineering, Jan. 1943
5. JASA, V. 32, No. 12, p. 1570
6. Ibid., p. 1572